ANNEXURE - I
COURSE STRUCTURE APPROVED IN 2ND JOINT BOS MEETING (28/12/2020)
(For 2020 – 2021 Admitted Batch) – V20 Regulation

I SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20MAT01	Linear Algebra and Differential Equations	3	0	0	3
2	V20PHT01	Engineering Physics	3	0	0	3
3	V20ENT01	English for Professional Enhancement	3	0	0	3
4	V20MEL01	Engineering Graphics	1	0	4	3
5	V20CST01	Programming in C for problem solving	3	0	0	3
6	V20ENL01	Hone Your Communications Skills Lab-I	0	0	3	1.5
7	V20PHL01	Engineering Physics Lab	0	0	3	1.5
8	V20CSL01	Programming lab in C for problem solving	0	0	3	1.5
9	V20CHT02	Environmental Studies	2	0	0	-
		Total	15	0	13	19.5

Total Contact Hours : 28   Total Credits : 19.5

II SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20MAT02	Numerical Methods and Vector Calculus	3	0	0	3
2	V20CHT01	Engineering Chemistry	3	0	0	3
3	V20MET01	Engineering Mechanics	3	0	0	3
4	V20EET02	Basic Electrical and Electronics Engineering	3	0	0	3
5	V20MEL02	Engineering Workshop	1	0	4	3
6	V20EEL02	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
7	V20CHL01	Engineering Chemistry Lab	0	0	3	1.5
8	V20ENL02	Hone Your Communications Skills Lab-II	0	0	3	1.5
		Total	13	0	13	19.5

Total Contact Hours : 26   Total Credits : 19.5

COURSE STRUCTURE APPROVED IN 4TH BOS MEETING (28/08/2021)

III SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20MAT04	Probability & Statistics (BOS of Maths)	3	0	0	3
2	V20CET01	Strength of Materials	3	0	0	3
3	V20CET02	Fluid Mechanics & Hydraulics	3	0	0	3
4	V20CET03	Surveying and Geomatics	3	0	0	3
5	V20CET04	Building Materials & Concrete Technology	3	0	0	3
6	V20CEL01	Strength of Materials Lab	0	0	3	1.5
7	V20CEL02	Surveying Lab	0	0	3	1.5
8	V20CEL03	Concrete Technology Lab	0	0	3	1.5
9	V20SOC01	Skill Oriented Course (Certificate course offered by Industries/Professional Bodies/APSSDC or any other accredited bodies)	1	0	2	2
10	V20ENT02	Professional Communication Skills-I (MNC) (BOS of Eng)	2	0	0	0
		Total	18	0	11	21.5

Total Contact Hours : 29   Total Credits : 21.5

IV SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20CET05	Engineering Geology	3	0	0	3
2	V20CET06	Structural Analysis - I	3	0	0	3
3	V20CET07	Water Resources Engineering	3	0	0	3
4	V20CET08	Transportation Engineering	3	0	0	3
5	V20MBT51	Managerial Economics Financial Analysis (BOS of MBA)	3	0	0	3
6	V20CEL04	Engineering Geology Lab	0	0	3	1.5
7	V20CEL05	FM & Hydraulic Machinery Lab	0	0	3	1.5
8	V20CEL06	Transportation Engineering Lab	0	0	3	1.5
9	V20SOC02	Skill Oriented Course (Certificate course offered by Industries/Professional Bodies/APSSDC or any other accredited bodies)	1	0	2	2
10	V20ENT03	Professional Communication Skills-II (MNC) (BOS of Eng)	2	0	0	0
Total			18	0	11	21.5

Total Contact Hours : 29   Total Credits : 21.5

Internship for 2 months/Mini Project is mandatory during summer vacation and is evaluated in V semester.

COURSE STRUCTURE PROPOSED FOR APPROVAL IN
5TH BOS MEETING

V SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20CET09	Structural Analysis - II	3	0	0	3
2	V20CET10	Geotechnical Engineering	3	0	0	3
3	V20CET11	Design of Reinforced Concrete Structures	3	0	0	3
4	V20CET12 V20CET13 V20CET14 V20CET15 V20CET16	Professional Elective Course I 1. Advanced Concrete Technology 2. Irrigation Engineering 3. Traffic Engineering & Management 4. Air Pollution and Control 5. Geo Environmental Engineering	3	0	0	3
5		Open Elective Course I / Job Oriented Elective	0	0	6	3
6	V20CEL07	Geotechnical Engineering Lab	0	0	3	1.5
7	V20CEL08	Structural detailing using Auto CAD Lab	0	0	3	1.5
8	V20SOC03	Skill Advanced Course /Soft Skills Course	1	0	2	2
9	V20ENT04	Professional Communication Skills-III (MNC) (BOS of English)	2	0	0	0
10	V20CESI1	Summer Internship / Mini Project	0	0	0	1.5
		Total	15	0	14	21.5

Total Contact Hours : 27   Total Credits : 21.5

VI SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20CET17	Design of Steel Structures	3	0	0	3
2	V20CET18	Foundation Engineering	3	0	0	3
3	V20CET19	Environmental Engineering	3	0	0	3
4	V20CET20 V20CET21 V20CET22 V20CET23 V20CET24	Professional Elective Course – II 1. Bridge Engineering 2. Earth Retaining structures 3. Urban Hydrology and Hydraulics 4. Pavement Analysis and Design 5. Remote sensing and GIS	3	0	0	3
5		Open Elective Course – II/Job Oriented Elective	3	0	0	3
6	V20CEL09	Environmental Engineering Lab	0	0	3	1.5
7	V20CEL10	CAD & GIS Lab	0	0	3	1.5
8	V20CEL11	Estimation, Contracts and Construction Management Lab	0	0	3	1.5
9	V20SOC04	Skill Advanced Course /Soft Skills Course	1	0	2	2
10	V20CEMC 01	Intellectual Property Rights & Patents (MNC)	2	0	0	0
		Total	18	0	11	21.5

Total Contact Hours: 30   Total Credits : 21.5

Internship 2 months / Mini Project is mandatory during summer vacation and is evaluated in VII semester.

VII SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	T	P	
1	V20CET25 V20CET26 V20CET27 V20CET28 V20CET29	Professional Elective Course III 1. Pre stressed Concrete 2. Advanced Foundation Engineering 3. Ground Water Development 4. Highway Construction and Management 5. Environmental Impact Assessment and Management	3	0	0	3
2	V20CET30 V20CET31 V20CET32 V20CET33 V20CET34	Professional Elective Course IV 1. Finite Element Methods 2. Engineering with Geo-synthetics 3. Urban Transportation Planning 4. Solid Waste Management 5. Prefabricated Structures	3	0	0	3
3	V20CET35 V20CET36 V20CET37 V20CET38 V20CET39	Professional Elective Course V 1. Earthquake Engineering 2. Ground Improvement Techniques 3. Rural Water Supply and onsite sanitation Systems 4. Metro Systems and Engineering 5. Architecture and Town Planning	3	0	0	3
4		Open Elective Course III / Job oriented	3	0	0	3
5		Open Elective Course IV / Job oriented	3	0	0	3
6	V20MBT54	Humanities and Social Science Elective Universal Human Values-II (BOS of MBA)	3	0	0	3
7	V20SOC05	Skill Advanced Course	1	0	2	2
8	V20CESI2	Summer Internship / Mini Project	0	0	0	3
		Total	19	0	2	23

Total Contact Hours :   23   Total Credits : 23

VIII SEMESTER

S.No	Course Code	Course Title	Hours per week			Credits
			L	**T**	**P**	
1		Project work, seminar and internship in industry	0	0	24	12
		Total	0	0	24	12

Total Contact Hours: 0   Total Credits: 12

Skill Oriented Courses
1. Total Station
2. 2D Drafting & 3D Modeling
3. Building Planning and Drawing
4. Building Information Modeling
5. Revit Architecture Software
6. Advanced C
7. ETABS Software
8. Primavera Software

ANNEXURE – VII(a)

Semester	I SEM	L	T	P	C	COURSE CODE
Regulation	V20	3	-	-	3	V20MAT01
Name of the Course	Linear Algebra and Differential Equations					
Branches	Common to All Branches					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Apply matrix technique to solve system of linear equations	K3
CO2	Find Eigenvalues and Eigen vectors	K3
CO3	Solve the ordinary differential equations of first order & first degree	K3
CO4	Solve the linear differential equations of higher order with constant coefficients	K3
CO5	Apply Laplace Transformation to given function	K3
CO6	Find maxima and minima of functions of two variables	K3

UNIT I: System of linear equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination – Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.

UNIT II: Eigenvalues, Eigen vectors and Cayley-Hamilton theorem:

Eigenvalues - Eigen vectors– Properties – Cayley-Hamilton theorem (without proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem.

UNIT-III: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact differential equations -Newton's Law of cooling-Law of natural growth and decay-Orthogonal Trajectories.

UNIT IV: Linear differential equations of higher order:

Linear non homogeneous differential equations of higher order with constant coefficients involving RHS term of the type e $^{\alpha x}$, sinax, cosax, polynomials in x, e $^{\alpha x}$V(x), xV(x)- method of variation of parameters.

UNIT V: Laplace Transformation:

Laplace transforms of standard functions, properties(without proof), transforms of tf(t), f(t)/t, transforms of derivatives and integrals, transforms of unit step function, Dirac delta function, Inverse Laplace transforms, convolution theorem (without proof)

Application: Solving ordinary differential equations with initial conditions using Laplace transforms.

UNIT VI: Partial Differentiation:

Introduction to partial differentiation -Total derivative - Functional dependence - Jacobian.- maxima and minima of functions of two variables (without constraints) and Lagrange's method (with constraints).

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India

2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press

3. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford University Press.

4. Dass H.K., RajnishVerma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

Semester	I/II SEM	L	T	P	C	COURSE CODE
Regulation	V20	3	-	-	3	V20PHT01
Name of the Course	ENGINEERING PHYSICS					
Branches	Common to All Branches					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Grasp the basic principles of structure of materials, crystallography and X-ray diffraction.	K2
CO2	Expose the students to the basic concepts of Lasers and their applications in optical fiber communication link	K3
CO3	Classify the applications of sound waves in various fields.	K2
CO4	Interpret wavelike behavior of matter and motivates the need of fundamental physical laws for better understanding of materials.	K3
CO5	Describe the properties of semiconducting materials	K2
CO6	Illustrate the fundamental concepts of dielectrics and Superconductors.	K4

UNIT-I

CRYSTALLOGRAPHY : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters –Crystal systems- Bravais lattices– Structures and packing fractions of SC,BCC and FCC

X-RAY DIFFRACTION: Directions and planes in crystals – Miller indices – Separation between successive [h k l] planes – Bragg's law-Bragg's x-ray spectrometer.

UNIT-II

LASERS: Introduction –Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients –Pumping schemes– Population inversion– Ruby laser- Helium Neon laser-Applications of LASER.

FIBER OPTICS: Introduction –Structure of an optical fiber- Principle of Optical Fiber – Acceptance angle and acceptance cone – Numerical aperture- Basic optical communication system-Advantages of optical fibers over conventional transmission lines.

UNIT – III

ACOUSTICS: Introduction - Sound absorption- Absorption coefficient-Reverberation- Reverberation Time –Basic requirements for constructing an acoustically good hall - Sabine's formula-Factors affecting acoustics of buildings and their remedial measures.

ULTRASONICS: Introduction- Production of Ultrasonic Waves Using Piezoelectric Effect and Magnetostriction Method- Non-Destructive Testing - Pulse Echo Technique –Applications of ultrasonics.

UNIT – IV

QUANTUM MECHANICS: Introduction-de-Broglie's concept of matter waves – Schrodinger's Time Independent& time dependent wave equations –Physical significance of the wave function- Particle in a one dimensional potential box.

FREE ELECTRON THEORY: Classical free electron theory (qualitative) – Assumptions and failures-Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory-Density of states (3D) - Fermi energy-Fermi – Dirac distribution.

UNIT – V

BAND THEORY OF SOLIDS: Bloch's function (qualitative) – Kronig – Penney model (qualitative)–formation of energy bands in crystalline solids based on Kronig Penny model –E vs K diagram- v vs K diagram- effective mass of an electron-Classification of crystalline solids-concept of hole.

SEMICONDUCTOR PHYSICS: Introduction - Types of Semiconductors-Intrinsic Semiconductors- Carrier concentration– Expression for Conductivity-Extrinsic semiconductors-Carrier concentrations-Dependence of Fermi energy on carrier concentration and temperature-Drift and diffusion currents-Einstein's Equation-Hall Effect-Hall coefficient-Applications of Hall Effect.

UNIT-VI

SUPERCONDUCTIVITY: Introduction- General properties – Meissner effect - Type I and Type II Superconductors- BCS Theory – Josephson effects (AC and DC) -Applications of superconductors.

DIELECTRIC PROPERTIES: Introduction- Types of polarizations-Electronic, Ionic and Orientation polarizations (qualitative) – Internal electric field – Clausius- Mossoti Equation.

Text Books:

1. A Text book of Engineering Physics, M.N. Avadhanulu and P.G.Kshirasagar,S.Chand Publications.
2. Engineering Physics DK Bhattacharya, Poonam and Tandom Publications.

Reference books:

1. Solid state Physics, A.J. Dekker by McMillan India Ltd.
2. Introduction to Solid state Physics, Charles Kittle, Willey India Pvt. Ltd.
3. Solid state Physics, S.O. Pillai by New Academic Science.
4. Basic Engineering Physics,Dr.P. SreenivasaRao, Himalaya Publishers.
5. Engineering Physics, V. Rajendran, McGraw Hill.
6. Engineering Physics, Sanjay D Jain and Girish G Sahasrabudhe., University Press.
7. Engineering Physics, Gaur and Guptha, DhanpatRai Publications.
8. Engineering Physics, P.K. Palanisamy, Sci Tech Publishers.

Annexure-X(a)

Semester	I SEM	L	T	P	C	COURSE CODE
Regulation	V20	3	-	-	3	V20ENT01
Name of the Course	English for Professional Enhancement					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Identify the central theme of the text, use cohesive items for coherence in a paragraph, recognize nouns and basic sentence structures.	K2
CO2	Restate the central idea of the letter by using appropriate vocabulary. Gain mastery over articles and prepositions	K2
CO3	Find the success formula after reading the text in detail to answer questions. Use appropriate tense and concord, find suitable vocabulary and format to draft letters and e-mails.	K3
CO4	Employ reading skills to comprehend the given biography. Interpret visual information .Use quantifiers appropriately and get acquainted with writing for media and statement of purpose	K3
CO5	Appraise the delivered lecture and text, recognize the contextual vocabulary, write error free academic proposals and prepare poster presentations.	K4
CO6	Infer the real meaning of the text, listen for global comprehension and identify foreign phrases, use active and passive voice, practise note making.	K4

Syllabus

UNIT-I

A DRAWER FULL OF HAPPINESS (From Infotech English, Maruthi Publications).

Vocabulary: Technical vocabulary, GRE Vocabulary , Antonyms and Synonyms, Word Applications, Verbal Reasoning and Sequencing of Words.

Grammar: Word forms and Function words; Nouns: singular and plural, Countable and uncountable, Basic Sentence Structure and Word Order, yes/no questions, Wh-questions.

Listening: Listening to short audio texts and identifying the topic, context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Self- Introduction and Introducing others. Asking and answering general questions on topics such as home, family, work, studies and interests.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Writing: Mechanics of Writing, Punctuation, Paragraph Writing

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-II

NEHRU'S LETTER TO HIS DAUGHTER INDIRA ON HER BIRTHDAY (From Infotech English, Maruthi Publications).

Vocabulary: Technical Vocabulary, GRE Vocabulary, Analogies, Antonyms and Synonyms, Word Applications.

Grammar: Articles, Prepositions

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics. Functional English: Greeting and Leave Taking.

Reading: Identifying sequence of ideas; Recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Identifying the main ideas, Rephrasing and Summarizing them, Paraphrasing.

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-III
STEPHEN HAWKING - POSITIVITY 'BENCHMARK' (From Infotech English, Maruthi Publications).

Vocabulary: Technical Vocabulary, GRE Vocabulary, Verbal Reasoning, Using Equivalents.

Grammar: Verbs, Tenses, Concord: Subject - Verb Agreement.

Listening: Listening for global comprehension and summarizing what is listened to both in speaking and writing

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences –recognizing, and interpreting specific context clues; strategies to use text clues for comprehension, critical reading.

Writing: Letter writing- types, format and principles of letter writing, E-mail Etiquette, Writing a Resume/CV and Covering Letter.

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-IV

LIKE A TREE, UNBOWED : WANGARI MAATHAI - BIOGRAPHY (From Infotech English, Maruthi Publications).

Vocabulary: Technical Vocabulary, GRE Vocabulary, Antonyms and Synonyms, Word Applications, Cloze Encounters, Phrasal Verbs, Verbal Reasoning.

Grammar: Quantifying Expressions - Adjectives and Adverbs: comparing and contrasting; Degrees of comparison

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio), listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - Asking for and Giving Information/Directions. Functional English: Asking for Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in text to convey information.

Writing: Interpreting Visual Information, Statement of Purpose, Writing for Media, Writing for Clarity.

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-V

STAY HUNGRY,   STAY FOOLISH (From Infotech English, Maruthi Publications).

Vocabulary: Technical Vocabulary, GRE Vocabulary, Antonyms and Synonyms, Word Applications, Phrasal Verbs, Verbal Reasoning.

Grammar: Identifying and Correcting Common Errors in Grammar and Usage (articles, prepositions, tenses, subject-verb agreement), Reported Speech.

Listening: Identifying key Terms, Understanding Concepts and Interpreting the Concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts. Functional English: Suggesting/Opinion giving.

Writing: Writing Academic Proposals - Writing Research Articles, Poster Presentation.

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-VI
ON SAYING PLEASE – A.G.Gardiner

Vocabulary: Technical Vocabulary, GRE Vocabulary, Antonyms and Synonyms, Foreign phrases.

Grammar: Active and Passive Voice.

Listening: Understanding Concepts, Global Comprehension from a TED talk.

Speaking: Giving Commands/instructions.

Readin : Reading Comprehension Practice for IELTS.

Writing: Note making, Blog writing.

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

Books Prescribed

"Infotech English", Maruthi Publications. (Detailed)

"The post Office" by Rabindranath Tagore, Macmillan India(Non - Detailed)

Reference books:

1. Bailey,Stephen. Academic writing: A handbook for international students. Routledge,2014.
2. Chase, Becky Tarver. Pathwasys: Listening,Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading and Writing Student's Book Pack (B1) Macmillan Educational.
4. The Official Cambridge Guide to IELTS, for Academic and General Training.(2015)

Practical English Usuage, Michael Swan, OUP ,1995.

Syllabi for the Mechanical Engineering courses offered in I & II semesters B. Tech under V20 Regulation

Semester	I/ II SEM	L	T	P	C	COURSE CODE
Regulation	V20	1	-	4	3	**V20MEL01**
Name of the Course	**ENGINEERING GRAPHICS**					
Branches	**Common to All Branches**					

Course Outcomes: After successful completion of the course, the student will be able to:

CO No.	Course Outcome	Knowledge Level
CO1	Understand the basic commands in CAD Software and draw the conic sections	K3
CO2	Construct different types of scales and special curves	K3
CO3	Draw the projections of the points and lines	K3
CO4	Develop the projections of planes and surfaces of regular solids	K3
CO5	Draw the Isometric projections and conversion of views	K3

PART – A

UNIT1:

Introduction to CAD Software: CAD Software Mechanical Desktop, Draw, Modify, Dimension tool bars, Annotations, Layers, ISI conventions in drawing.

CONIC SECTIONS – Ellipse, Parabola and Hyperbola

UNIT 2: SPECIAL CURVES & SCALES: Special Curves – cycloid, epicycloids, hypocycloid; Scales – Plain, Diagonal and Vernier Scales.

UNIT 3: ORTHOGRAPHIC PROJECTIONS: Introduction to Orthographic Projections- Projections of Points, Projection of lines inclined to both the planes.

UNIT 4: PROJECTION OF PLANES: Inclined to both the Planes.

PROJECTION OF REGULAR SOLIDS: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes, Development of Surfaces of regular solids.

PART – B

UNIT 5: ISOMETRIC PROJECTIONS: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids.

UNIT 6: Conversion of Isometric Views to Orthographic Views and Vice-versa.

Text Books:

1. Engineering Drawing by N.D. Bhat, Chariot Publications, 53rd Edition-2014

2. Engineering Drawing by Agarwal&Agarwal, Tata McGraw Hill Publishers, 2nd Edition-2016

Reference Books:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers, 2nd Edition-2014

2. Engineering Graphics for Degree by K.C. John, PHI Publishers-2014

3. Engineering Graphics by PI Varghese, McGrawHill Publishers-2013

4. Engineering Drawing AutoCad – K Venugopal, V. Prabhu Raja, New Age, 5th Edition-2015

Course Evaluation:
Continuous Internal Evaluation (30M):
1. Day to Day Evaluation (20M): CAD Practice (Minimum of 20 Exercises)
2. Mid Examination (10M):

MID-I (10M) - Answer all 3 questions, each question carries 10 Marks with a total of 30M and scaled down to 10M.
      i.   Question -1 ---CO1
      ii.   Question -2 ---CO2
      iii.   Question -3 ---CO3
MID-II (10M) - Answer all 3 questions, each question carries 10 Marks with a total of 30M and scaled down to 10M.
      i.   Question -1 ---CO4
      ii.   Question -2 ---CO5
      iii.   Question -3 ---CO5
10Marks will be allocated as, 80% of best and 20% of least of the mid examinations.
Semester External Examination (70M):
1. Part A (48M): Answer four questions (Each question carry 12 marks)
2. Part B (22M) : Answer any one question
Part-A:
    i.   Question-1 or Question-2 --- CO1 (12M)
    ii.   Question-3 or Question-4 --- CO2 (12M)
    iii.   Question-5 or Question-6 --- CO3 (12M)
    iv.   Question-7 or Question-8 --- CO4 (12M)

PART-B:
    i.   Question-9 or Question-10 --- CO5 (22M)

Semester	I /II SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	V20CST01
Name of the Course	Programming in 'C' for problem Solving					
Branches	Common to All					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Describe various problem solving strategies such as Algorithms and Flowcharts	K2
CO2	Develop various programming constructs using Control Structures	K3
CO3	Construct Programs using modular programming approach	K3
CO4	Illustrate the usage of Arrays, String and pointers	K3
CO5	Construct Programs using Structures and Unions	K3
CO6	Distinguish between Sequential files and Random access files	K4

UNIT-I: Problem solving concepts: Algorithms, Flow-charts, Types of Programming Languages, Compiler, Assembler and Linker, Testing and Debugging a program. **Introduction to C Programming:** Overview and importance of C, C Program Structure, Creation and Compilation of C Programs, Identifiers, Variables, Data types, Constants, Declarations, **Input and output statements:** Input and output functions..

UNIT-II: Operators: Arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operator, bitwise operators, special operators, expressions, Precedence, Associatively, Order of evaluation, Type conversion, Programming Examples. **Control Structures:** Conditional statements - If-else, Switch-case constructs, Loops - while, do-while, for.

UNIT-III: Functions: Top down approach of problem solving, standard library functions, user defined functions, parameter passing - call by value, call by reference, return statement, passing arrays as parameters to functions, recursion. **Storage Classes:** Scope and extent, Storage Classes - auto, extern, static and register.

Understanding pointers: Accessing the address of a variable, declaring pointer variables, initialization of pointer variables, accessing a variable through its pointer, pointer arithmetic.

UNIT-IV: Arrays: Single-Dimensional Arrays, multi-Dimensional Arrays, initialization and accessing individual elements. **Strings** in C- Concepts, string handling functions. Pointer and arrays, pointers and character strings, array of pointers. **Dynamic Memory Allocation**: calloc(), malloc() and free()

UNIT-V: Structures: Defining, declaring, initialization, accessing, comparing, operations on individual members, array of structures, structures within structures, structures and functions, bit fields, Programming Examples. **Unions:** Definition – difference between structures and unions – declaring and accessing unions.– pointers and structures – self-referential structures.

UNIT-VI: File Processing: Creating and Opening a file, file opening modes, closing a file, input/output operations on files, error handling during I/O operations, random access to files, Command line arguments. Programming Examples.

TEXT BOOKS:
1. Programming in ANSI C by E Balagursamy, McGraw Hill, 8th Edition.

REFERENCE BOOKS:
1. Let Us C, YashavantKanetkar, BPB Publications, 15th Edition
2. Programming in C, ReemaThareja, Oxford.
3. Programming with C, Second edition, Byron S Gottfried, Tata McGrawhill
4. Problem Solving and Programm design in C, Hanly J R &Koffman E.B, Pearson Education, 2009.
5. Programming in C, PradipDey, ManasGhosh, Oxford University Press, 2007.
6. Problem Solving Using C: Structured Programming Techniques, YukselUckan.
7. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
8. Computer Programming in C – Kerninghan& Ritchie, PHI
9. C: The Complete Reference: Herbert Schildt, Osborne/Mcgraw Hill, Inc.

Semester	I SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	V20ENL01
Name of the Course	Hone your Communication Skills, Lab-I					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Identify suitable expressions to greet people, say good bye to them, introduce one another, listen to consonants	K2
CO2	Select suitable words to invite someone, accept or decline invitations, listen to..., identify and produce vowel sounds	K2
CO3	Choose suitable expressions to seek/refuse permissions, to apologize and listen to word accent	K3
CO4	Find apt expressions to give suggestions, express opinions and identify tone groups.	K3
CO5	Use appropriate words to give commands, requests and identify pauses and prominent syllables	K3
CO6	Practise listening to dialogues, role-plays using common vocabulary used in dialogues	K3

Syllabus

Unit-1   Hello, I'm

- Greeting people
- Saying goodbye to people
- Introducing yourself to someone/someone to someone else
- Listening and Identifying Consonants

Unit-2   I Would Love to…. but,

- Inviting someone
- Accepting or declining invitations
- Complaining about something
- Listening to, Identifying and Producing Vowel Sounds

Unit-3 With Your Permission I would like to…..

- Seeking Permission
- Granting/refusing permissions
- Apologising
- Listening to syllables and Word Accent and practise.

Unit-4 Why don't we….?

- Making Suggestions
- Agreeing/disagreeing with a suggestion
- Expressing Opinions
- Using Weak Forms
- Identifying Tone Groups

Unit-5 Could you Please….

- Giving Commands/instructions
- Requesting someone for something
- Identifying pauses and prominent syllables
- Identifying and using different tones

Unit-6 Dialogues

- The norms of dialogues
- Common vocabulary used in dialogues
- Carrying on a dialogue
- Listening to dialogue.

Book Prescribed

Strengthen Your Steps - A multimodal course in communication skills (Maruthi Publications)

Books for Further Reference

1. Better English Pronunciation (J.D.O'Connor), Cambridge University.

2. English Conversation Practice (A Practical Guide to improve Conversational Skills), Sterling Publishers.

3. Exercise in spoken English, Parts-I-III.CIFEL, Hyderabad, Oxford University Press.

Semester	I/II SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	V20PHL01
Name of the Course	ENGINEERING PHYSICS LAB					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	K4
CO2	Demonstrate the various experiments in the areas of optics, mechanics and Electronics in all branches of engineering.	K3
CO3	Think innovatively and also apply the creative skills that are essential for engineering.	K4

List of Experiments:
(Any eight of the following to be done)

1. Determination of Rigidity modulus of a material – Torsional Pendulum
2. Determination of acceleration due to gravity – Compound Pendulum
3. Verification of laws of vibrations in stretched strings – Sonometer
4. Determination of velocity of sound – Volume Resonator
5. Verification of Magnetic field Induction along the axis of current carrying coil – Stewart and Gee's apparatus.
6. Determination of Planck's constant using photocell.
7. Determination of wave length of laser source using diffraction grating.
8. Determination of frequency of electrically driven tuning fork - Melde's experiment – Transverse and longitudinal modes.
9. Study of V/I Characteristics of Zener diode.
10. Draw the frequency responsive curves of L-C-R Series Resonance Circuit.
11. Determination of Energy band gap of a Semiconductor p-n junction.

12. Characteristics of Thermistor – Negative Temperature Coefficient of resistivity.

Virtual labs:
  (Any two of the following to be done)
1. Crystal Structure.
2. Numerical Aperture of an Optical Fiber.
3. Photo-Electric Effect.
4. Hall Effect.

Semester	I/II SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	V20CSL01
Name of the Course	Programming Lab in 'C' for problem Solving					
Branches	Common to All					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Demonstrate problem solving techniques using Control Structures	K3
CO2	Construct Programmes using the concepts of Arrays, Strings and Pointers	K3
CO3	Apply the concepts of Functions, Structures and Unions	K3
CO4	Use various file processing operations to develop real-time applications	K4

LIST OF EXPERIMENTS

Tutorial 1: Problem solving using computers.

Lab1: Familiarization with programming environment.

Tutorial 2: Variable types and type conversions.

Lab 2: Simple computational problems using arithmetic expressions.

Tutorial 3: Branching and logical expressions.

Lab 3: Problems involving if-then-else structures switch – case.

Tutorial 4: Loops, while and for loops.

Lab 4: Iterative problems e.g. sum of series.

Tutorial 5: Functions call by value, call by reference

Lab 5: Simple functions.

Tutorial 6: Recursion, structure of recursive calls.

Lab 6: Recursive functions.

Tutorial 7: Pointers.

Lab 7: Programming with pointers.

Tutorial 8: 1D Arrays: searching, sorting.

Lab 8: 1D Array manipulation.

Tutorial 9: 2D arrays.

Lab 9: Matrix problems.

Tutorial 10: String handling.

Lab 10: String handling functions.

Tutorial 11: Structures, unions and dynamic memory allocation.

Lab 11: Structures & unions.

Tutorial 12: File handling, command line arguments.

Lab 12: File operations.

TEXT BOOKS:
1. Programming in Ansi C by E Balagursamy, McGraw Hill, Eight Edition.

Reference Books:

1. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.
2. Computer Programming in C, V. Rajaraman, PHI.
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. C- The Complete Reference, Herbert Schildt, Osborne/Mcgraw Hill, Inc.
5. Programming with C, Byron S Gottfried, Second edition, Tata McGrawhill.
6. Programming in C, ReemaThareja, Oxford.
7. Problem Solving and Program design in C, Hanly J R &Koffman E.B, Pearson Education, 2009
8. Programming and Problem Solving Using C, ISRD Group, Tata McGraw Hill,2008

Semester	I SEM & II SEM	L	T	P	C	COURSE CODE
Regulation	V20	2	-	-	0	V20CHT02
Name of the Course	ENVIRONMENTAL STUDIES					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Recognise the importance of environment and ecosystem services	K2
CO2	Identify the characteristic features, uses and impact of overutilization of natural resources	K2
CO3	Explain biodiversity, biodiversity services and conservation of biodiversity	K2
CO4	Report the causes and impacts of various pollutions	K2
CO5	Illustrate social and global environmental issues; sustainable development practices	K2
CO6	Describe environmental management and environmental legislations in India	K2

UNIT 1: MULTIDISCIPLINARY NATURE OF ENVIRONMENT & ECOSYSTEM

Definition, Scope and importance of environment, Typesof environment, Multidisciplinary nature of Environmental Studies, Components of environment.

Ecosystem - Concept of an Ecosystem, Structure and function of an Ecosystem, Food chain & food web, Ecological Pyramids, Structure and function of Forest, Desert, Pond and Marine ecosystem.

UNIT 2: NATURAL RESOURCES

Forest Resources: Uses, Overexploitation, Deforestation.

Water resources: Aquifers, Dams and benefits, Conflicts over water.

Mineral resources: Uses, Overexploitation, Environmental impact of extraction and use of mineral resources.

Land resources: Degradation, Soil erosion and desertification, Landslides.

Renewable Energy resources: Solar energy, Geo thermal energy, Tidal Energy.

UNIT 3: BIODIVERSITY AND ITS CONSERVATION

Definition,LevelsofBiodiversity,ValuesofBiodiversity,HotspotsofBiodiversity,ThreatstoBiodiversity, Endangered and Endemic species of India, In-situ and Ex-situConservation.

UNIT 4: ENVIRONMENTAL POLLUTION

Definition of pollution, Air pollution- Types of Air pollutants, Effects and control measures; Water pollution- Causes, Effects and control measures; Soil pollution;

Biomedical waste; Industrial waste- Process of waste management, Sanitary land fill, Incineration, 3R strategy; E- Waste and its management.

UNIT 5: SOCIAL AND GLOBAL ENVIRONMENTAL ISSUES

Family welfare - Women Education, Value education, Role of information technology on environment and human health, Acid rains, Global warming, Ozone layer depletion and Population growth.

UNIT 6: ENVIRONMENTAL MOVEMENTS, LEGISLATIONS AND MANAGEMENT

Chipko movement, Tehri dam conflict, and Silent Valley Project.

Importance of environmental legislation, Environmental Protection Act, Wildlife Protection Act, Air Act (Prevention and control of pollution), Water Act; Environmental management- EIA.

Text books:
1. Environmental Studies, Fourth Edition, ANubhaKaushik, C P Kaushik, New Age International Pubishers.
2. A Textbook of Environmental Studies, ShashiChawla, TMH, New Delhi.
3. Fundamentals of Environmental Studies, DD Mishra, S Chand & Co. Ltd.
4. Textbook of Environmental Science, DR M. Anjireddy, B.S Publications, Hyderabad.

Semester	II SEM	L	T	P	C	COURSE CODE
Regulation	V20	3	-	-	3	V20MAT02
Name of the Course	Numerical Methods and Vector Calculus					
Branches	Common to All Branches					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Compute approximate roots of algebraic and transcendental equations and interpolating polynomial for the given data	K3
CO2	Solve ordinary differential equations with initial conditions using numerical methods	K3
CO3	Find multiple integrals and improper integrals	K3
CO4	Calculate gradient of a scalar function, divergence and curl of a vector function	K3
CO5	Apply the knowledge of vector integral concepts to find characteristics of vector fields	K3
CO6	Find Fourier series of a periodic functions	K3

UNIT I:Solutionof Algebraic and Transcendental Equations and Interpolation:

Introduction- Bisection method – Method of false position– Newton-Raphson method (One variable) - finite differences- forward differences, backward differences – simple relations on forward, backward, central, average and shifting operators - Newton's formulae for interpolation - Lagrange's interpolation formula.

UNIT II: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's 1/3rd and 3/8th rule-Solution of ordinary differential equations by Taylor's series- Picard's Method - Euler's method- Euler's modified Method – Runge-Kutta method (fourth order).

UNIT III: Multiple Integrals:

Definition of Improper integrals - Double and triple integrals – Change of variables – Change of order of integration.

UNIT IV: Vector Differentiation:

Vector differential operator - Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

UNIT V: Vector Integration:

Line integral: Work done – Potential function – Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

UNIT VI: Fourier series:

Fourier series -Introduction, Periodic functions, Fourier series of a periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half-range sine and cosine series.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-

2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press

3. V.Ravindranath and P.Vijayalakshmi, Mathematical Methods, Himalaya Publishing House. India

4. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford University Press.

5. Dass H.K., RajnishVerma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

Annexure-IX(a)

Semester	I/II SEM	L	T	P	C	COURSE CODE
Regulation	V20	3	-	-	3	V20CHT01
Name of the Course	ENGINEERING CHEMISTRY					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Solve boiler troubles originated due to poor water quality and suggest suitable water treatment methods.	K3
CO2	Choose plastics and rubbers for engineering applications	K3
CO3	Associate concepts of Electro Chemistry in designing electrochemical energy systems	K2
CO4	Assess the quality of fuels	K3
CO5	Apply corrosion principles for protection of metallic structures	K3
CO6	Interpret important applications of engineering materials	K2

UNIT I: WATER TECHNOLOGY

Sources of water; Impurities in water, Hardness of water, Types of Hardness, Units of hardness, Determination of hardness of water, Numerical problems on temporary and permanent hardness.

Boiler troubles: Priming and Foaming, Sludge and Scale formation, Boiler corrosion, Caustic embrittlement. Softening of hard water- Zeolite process and Ion exchange process; Water for drinking purpose, BSI standards of drinking water, Disinfection: Chlorination, Break point chlorination. Desalination - Reverse Osmosis and Electro dialysis.

UNIT II: POLYMER TECHNOLOGY

Introduction, Polymerization, Mechanism of Free radical addition polymerization; Plastics as engineering materials; Advantages and limitations, Thermoplastics and Thermosetting plastics, Fabricationof plastics (Compression, Injection, Transfer, and Extrusion Moulding) - Preparation,properties and applications of Polythene (HDPE and LDPE), PVC, Bakelite.

Elastomers: Disadvantages of natural rubber, Vulcanization of rubber, Advantages of vulcanized rubber, Preparation, properties and applications of Buna -S and Buna-N.

UNIT III: ELECTROCHEMISTRY

Galvanic cell, Electrode potential and EMF - Reference electrodes (Calomel and Glass electrodes), Determination of pH of a solution using glass electrode, Conductometric titration (Strong Acid– Strong Base).

Batteries: Types, Primary battery - $Li-MnO_2$ battery, Secondary batteries - Lead acid battery,Lithium ion battery.

Fuel cells: Definition, H_2 - O_2 fuel cell

UNIT IV: FUEL TECHNOLOGY

Fuels – Characteristics of a good fuel, Classification of fuels, Calorific value (HCV and LCV), Dulong's formula, Numerical problems on HCV and LCV.

Solid fuels: Coal – Proximate and ultimate analysis, Significance of the analyses.

Liquidfuels: Petroleum composition, Classification, Synthetic petrol (Fischer Tropsch and Bergius process), Knocking, Anti knocking agents, Octane and Cetane ratings.

Gaseous fuels – Natural gas, LPG and CNG

Biofuels - Biogas, Biodiesel.

UNIT V: CORROSION AND ITS PREVENTION

Definition, Theories of Corrosion (Chemical & Electrochemical), Pilling-Bedworth Rule, Types of electrochemical corrosion (Galvanic corrosion, Concentration cell corrosion, Stress corrosion and

Pitting corrosion), Galvanic series, Factors which influence the rate of corrosion. Protection from corrosion - Design & Selection of metals, Cathodic protection, Protective coatings – Metallic coatings (Anodic and cathodic coatings), Methods of application of coatings on metals (Galvanizing, Tinning, and Electroplating).

UNIT VI: CHEMISTRY OF ENGINEERING MATERIALS

Nano materials: Introduction, Carbon nanotubes - Types, preparation (Arc discharge, Laser ablation and CVD Method) - Properties and applications of carbon nanotubes.

Cement: Composition, Manufacture of cement (Wet process), Setting and hardening of cement.

Biodegradable polymers: PHBV, Poly Lactic Acid - Applications

Conducting polymers: Types, Conduction mechanism in Polyacetylene, Applications.

Text Books:
1. Engineering Chemistry by Jain and Jain; DhanpatRai Publications & Co.
2. A Text book of Engineering Chemistry by S. S. Dara; S. Chand &Co Ltd.

Reference Books:
1. Engineering Chemistry by Vajiram and others. Wiley India Pvt. Ltd.,
2. Engineering Chemistry by PrasanthRath, Cengage Learning.
3. Engineering Chemistry by ShikhaAgarwal; Cambridge University Press.
4. Engineering Chemistry, by B. Sivasankar, McGraw-Hill.

Semester	I/II SEM	L	T	P	C	COURSE CODE
Regulation	V20	3	-	-	3	**V20MET01**
Name of the Course	**ENGINEERING MECHANICS**					
Branches	**Common to CE & ME**					

Course Outcomes: After successful completion of the course, the student will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Compute the resultant force of a given system of forces and understanding of concepts on friction.	K3
CO2	Calculate the forces in the different types of plane trusses	K3
CO3	Find the Centroid, Center of Gravity and Moment of Inertia for plane figures and bodies	K3
CO4	Illustrate the different types of plane motions of a particle to compute its velocity, acceleration and force.	K3
CO5	Illustrate the concept of Work and Energy	K3
CO6	Apply the principle of Virtual Work to stability of equilibrium of Ladder	K3

Unit I: Introduction to Engineering Mechanics – Basic Concepts.
Systems of Forces: Coplanar Concurrent Forces – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.
Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems for concurrent forces. Lami's Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.
Friction : Introduction, Limiting friction and impending friction, ladder and wedge friction.

Unit II: Analysis of Trusses by Method of Joints: Types of Trusses - Assumptions for forces in members of a perfect truss, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

Unit III: Centroid: Centroid of simple figures (from basic principles) – Centroid of Composite Figures Centre of Gravity: Centre of gravity body (from basic principles), centre of gravity of composite bodies, Pappus theorems.
Moment of inertia of plane figures: I-section, T-section, Channel section, Z-section and L-section.

Unit IV: Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Unit V: Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

Unit VI: Principle of Virtual Work: Principle of virtual work, advantages of principle of virtual work, principle of virtual applied to stability of equilibrium. Application of principle of virtual work limited to ladder problems.

Text Books:

1. Engineering Mechanics by A.K.Tayal ,Umesh Publications.

2. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.

3. Engineering Mechanics, S.S Bhavikatti, K. G. Rajashekarappa. New Age International publication.

Reference Books:

1. Engg.Mechanics - S.Timoshenko&D.H.Young., 4th Edn - , McGraw Hill publications.

2. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best& W.G. McLean, 5th Edn – Schaum's outline series - McGraw Hill Publ.

3. Meriam J. L., Kraige L. G., "Engineering Mechanics – Dynamics", Wiley Student Edition, (Sixth Edition) reprint 2011.

4. Beer F. P., Johnston E. R., "Vector Mechanics for Engineers Statics and Dynamics", Tata, McGraw Hill Publishing company Ltd., New Delhi (Eighth Edition) reprint 2009

5. Shames Irving H., "Engineering Mechanics", Prentice Hall, New Delhi (Fourth edition) reprint 2009.

Semester	II SEM	L	T	P	C	**COURSE CODE**
Regulation	V20	3	-	-	3	**V20EET02**
Name of the Course	Basic Electrical & Electronics Engineering					
Branches	Common to ME & CE					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
C113.1	Understand and compute electrical quantities in DC excited circuits	K3
C113.2	Understand and compute electrical quantities in AC excited circuits	K3
C113.3	Study the working principles of DC machines	K2
C113.4	Study the working principles of transformers	K2
C113.5	Understand construction details and explain the working principles of AC machines	K2
C113.6	Understand the basic operation of uninterrupted power supplies	K2

Unit 1 : DC Circuits

Electrical circuit elements (R, L and C), Kirchhoff's Laws, Mesh analysis of simple circuits with dc excitation.Superposition, Thevenin's, and Maximum Power Transfer Theorems, Simple problems.

Unit 2: AC Circuits

Basic Definitions, Peak and RMS values, Types of Powers, Power Factor.Analysis of Single-Phase AC series circuits consisting of RL, RC, RLC combinations, Simple problems.

Unit 3: DC Machines

Construction and operation of DC generator -EMF equation - Types of DC motors: shunt and series motors – applications – Speed control of DC shunt motor: field and armature controls, Simple Problems.

Unit 4: Transformers

Classification, Operation of ideal and practical transformers, EMF equation, losses in transformer, efficiency, OC and SC Test, Simple problems.

Unit 5: AC Machines

Construction and operation of a three-phase induction motor, Slip, torque equation, torque-slip characteristics. Construction and operation of Synchronous Generator, Simple problems.

Unit 6: Uninterrupted Power Supplies

Introduction –Basic operation of Rectifier, Inverter and UPS -On-line UPS, Off- line UPS and Line interactive UPS, Comparison between UPS and Inverter, Basic operation of SMPS.

Text Books

1. SmarajitGhosh, "Fundamentals of Electrical and Electronics Engineering", PHI Publishers, 2nd Edition, 2010.
2. S. K. Sahdev, "Fundamentals of Electrical Engineering & Electronics", DhanpatRai& Company, 2nd Re Edition, 2010.
3. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Education India, 2nd Edition, 2017.
4. M. S. Sukhija,T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, 1st Edition, 2012.
5. Ned Mohan, T M Undeland and W P Robbins, "Power Electronics-Converters, Applications and Design", John Wiley & Sons, INC, 2nd Edition, 2008.

Reference Books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2018.
2. E. Hughes, "Electrical and Electronics Technology", Pearson Education India, 1st Edition, 2010.
3. R. K. Rajput, "Basic Electrical and Electronics Engineering", University Science Press, 2nd Edition, 2012.

Semester	I/II SEM	L	T	P	C	COURSE CODE
Regulation	V20	1	-	4	3	**V20MEL02**
Name of the Course	**ENGINEERING WORKSHOP**					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of the course, the student will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Prepare different models in the carpentry trade and understand basic concepts of carpentry	K3
CO2	Develop various basic prototypes in the trade of Tin smithy and understand basic concepts of Tin smithy.	K3
CO3	Prepare various basic prototypes in the trade of fitting and understand basic concepts of fitting.	K3
CO4	Prepare different models in the Black smithy and understand basic concepts of Black smithy.	K3
CO5	Develop various basic House Wiring techniques, Electrical wiring circuits	K3
CO6	Develop various basic prototype models in Welding and Foundry shop.	K3

Module-I
General safety Considerations during operation of:
Bench Tools, Hammers, Screw Drivers, Punches, Chisels, Scrapers, Scribers, Files, Pliers and Cutters, Wrenches, Hacksaw, Bench Vise, Hand drill, Taps and Dies, Hand Shears, Rules, Tapes and Squares, Soldering Iron, Rivets.
Hand Working Operations:
Sawing, Filing, Threading, Scribing, Shearing, Soldering, Sharpening of hand tools.
Measuring and Gauging:
Calipers, depth Gauge, Feeler Gauge, Micrometers, Vernier Calipers, Vernier Height Gauge, Snap Gauge, Hole Gauge, Bevel Protractor, Dial Indicator, Gauge Blocks and Surface Plate

Module-II
Carpentry:
Introduction, Carpentry Tools, Marking and Layout, Operations.
Sheet Metal Works :
Introduction, Sheet Metal Tools, Marking and Layout, Operations – Bending, Cutting, Rolling.
Fitting :
Introduction, Fitting Tools, Marking and Layout, Operations.

Forging :
Introduction , Forging Tools ,Operations – Upsetting, Drawing, Cutting, Bending, Punching ,Forging Presses and Hammers.

House wiring:
Introduction, House wiring Tools and accessories, Connections, Circuit diagrams.

Metal Joining:
Safety Considerations, Introduction, Soldering, Brazing, Welding – Gas Welding, Arc Welding,

Foundry:
Introduction, Pattern Making, Foundry Tools, Core Making, Melting Furnace – Cupola, Sand Casting   Process.

Module-III
Note: At least two exercises to be done from each.

Carpentry
1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tenon Joint

Tin Smithy
1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

Fitting shop
1. V- Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black smithy
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House wiring
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Welding shop (Arc welding)

1. Butt Joint
2. Lap Joint

Foundry Practice

Preparation of sand mould using split piece pattern and cast the component.

Text Books:

1. A Course in Work shop Technology, Vol.1, Raghuwanshi,DhanpatRai&Co.
2. Elements of Workshop Technology, Vol.1, S.K.HajraChoudary, Asia Publishing House.
3. Production Technology, Vol.1, R.K.Jain and S.C Gupta, Khanna Publications.
4. Workshop Practice Manual,K.Venkata Reddy, B.S.Publications.
5. Workshop Manual, P.Kannaiah, KL.Narayana, Scitech Publications.

Semester	II SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	**V20EEL02**
Name of the Course	**Basic Electrical & Electronics Engineering Lab**					
Branches	**Common to CE & ME**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
C115.1	Determine the load currents by applying various laws and theorems	K3
C115.2	Analyze the steady state performance of series circuits	K3
C115.3	Plot the speed control characteristics of DC shunt motor	K3
C115.4	Find the losses and efficiency of a transformer	K3
C115.5	Calculate the energy bill for Domestic loads	K3
C115.6	Plot characteristics of full wave rectifier	K3

Any 10 of the following experiments are to be conducted

1. Verification of Kirchhoff's Laws.
2. Verification of Superposition theorem.
3. Verification of Thevenin's theorem.
4. Verification of Maximum Power Transfer theorem.
5. Analysis of Series RL and RC circuits.
6. Analysis of Series RLC circuit.
7. Speed control of D.C. Shunt motor by Armature control method.
8. Speed control of D.C. Shunt motor by field flux control method.
9. Brake test on DC shunt motor. Determination of performance characteristics.
10. Load Test on Single-Phase transformer
11. OC and SC test on Single-phase transformer (Measurement of Losses)
12. Energy Bill calculation for Domestic loads.
13. Full wave rectifier with and without filters.

Semester	I / II SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	V20CHL02
Name of the Course	ENGINEERING CHEMISTRY LABORATORY					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Analyze quantitatively a variety of samples using volumetric methods and instrumental methods	K4
CO2	Apply volumetric and instrumental methods for the determination of water quality parameters namely Alkalinity, Hardness and pH	K3
CO3	Prepare polymeric materials, nanoparticles and analyze the given coal samples	K3

List of Experiments:
1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions,
   Volumetric titrations, Quantitative analysis, Qualitative analysis etc.,
2. Estimation of HCl using standard Na_2CO_3 solution.
3. Estimation of $KMnO_4$ using standard oxalic acid solution.
4. Determination of alkalinity of a sample of water.
5. Determination of total hardness of water using standard EDTA solution.
6. Estimation of copper using standard EDTA solution.
7. Estimation of ferrous iron using standard $K_2Cr_2O_7$ solution.
8. Estimation of pH of the given sample solution using pH meter.
9. Conductometric titration between strong acid and strong base.
10. Proximate analysis of coal.
11. Preparation of phenol – formaldehyde resin.
12. Preparation of ZnO_2 Nanoparticles by sol-gel method.

Text Book:

1. Lab manual prepared by Department of Chemistry, Sri Vasavi Engineering College.

Reference Books:

1. Practical Engineering Chemistry by K. Mukkanti, B.S. Publications.
2. Vogel's Quantitative Chemical Analysis – 5th Edition, Longman.
3. A Text Book on experiments and Calculations Engineering by S.S.Dara, S.Chand& Co Ltd.

Semester	II SEM	L	T	P	C	COURSE CODE
Regulation	V20	-	-	3	1.5	V20ENL02
Name of the Course	Hone your Communication Skills, Lab-II					
Branches	**Common to All Branches**					

Course Outcomes:

After successful completion of this course, the students will be able to

CO No.	Course Outcome	Knowledge Level
CO1	Collect suitable expressions and vocabulary to participate in JAM.	K1
CO2	Prepare, face and perform well in interviews with required etiquette.	K3
CO3	Use appropriate telephone etiquette to succeed in telephonic interviews.	K3
CO4	Show team spirit and communicative skills in group discussion.	K3
CO5	Arrange ideas and prepare to give presentations in a professional manner.	K4
CO6	Debate rationally and cogently while putting forth the ideas.	K4

Syllabus

Unit-1   JAM Session

- Preparation for JAM Session
- Participation in JAM

Unit-2   Interviews

- Guidelines for facing interviews
- Three R's of interviews
- Practice Activity (Mock Interviews)

Unit-3 Effective Telephone Interviews

- Telephone Etiquette
- Preparing for telephonic interviews
- Acing interviews
- Practice Activity (Mock Interviews)

Unit-4   Group Discussions

- Tips to participate in Group Discussion
- Practice Activity

Unit-5   Presentation and Public Speaking

- Three P's of Presentation
- Do's and Don'ts in a Power-point Presentation
- Oral Presentations
- Introduction to Public Speaking
- Strategies for successful Public Speaking
- Practice Activity

Unit-6   Debate

- Introduction to Debate
- Parts of a Debate
- Guidelines to participate in a Debate
- Practice Activity

Book Prescribed

Strengthen Your Steps - A multimodal course in communication skills (Maruthi Publications)

Books for further reference

1. English Language Communication Skills, Lab Manual cum Workbook (with CD),Cengage Learning.

2. The Students Companion –Wilfred D. Best (New Edition) – Harper,CollinsPublishers,2012.

3. Hewings, Martin. Cambridge Academic English (B2).CUP, 2012.

ANNEXURE – V
SYLLABI OF III & IV SEMESTERS OF B.TECH V20 REGULATION
ACADEMIC YEAR 2021-2022

III SEMESTER – SYLLABUS

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET01
Name of the Course	STRENGTH OF MATERIALS					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon completion of the course, the student will be able to
- Understand the basic materials behavior under the influence of different external loading conditions and the support conditions (K2)
- Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces (K3)
- Understand bending concepts and calculation of section modulus and for determination of stresses developed in the beams and torsion (K3)
- Understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections (K2)
- Asses stresses in different engineering applications like columns and struts subjected to different loading conditions (K3)

SYLLABUS

UNIT I
Simple Stresses ,Strains and Strain Energy: Elasticity and plasticity –Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Workingstress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elasticmoduli and the relationship between them – Bars of varying section – composite bars –Temperature stresses. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT II
Shear Force and Bending Moment: Definition of beam – Types of beams –Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam
Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. Uniformly varying load. Mohr's theorems – Moment area method – application to simple cases .

UNIT III
Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.
Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections, built up beams, shear centre Torsion- Derivation of torsion equation and its assumptions.

UNIT-IV
Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions. Theories of failures: Various Theories of failures such as Maximum Principal stress theory –Maximum Principal Strain Theory – Maximum shear stress theory – Maximum strain energy theory –Maximum shear strain energy theory.

UNIT-V
Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns – assumptions – derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – Slenderness ratio –Euler' critical stress – Limitations of Euler' theory – Rankine– Gordon formula – Long columns subjected to eccentric loading – Secant formula –Empirical formulae – Straight line formula – Prof. Perry' formula.

Text Books:
1. Mechanics of Materials- R. C. Hibbler, Pearson; 10 edition (January 15, 2016)
2. Strength of materials -S. S. Bhavakatti, Vikas Publishing House; Fourth edition (2013)
3. Strength of Materials -R. K. Rajput, S. Chand Publishing (6th Edition) (2015)
4. Strength of Materials - R.K Bansal,Laxmi Publications; Sixth edition (2018)

References:
1. 1.Fundamentals of Solid Mechanics M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi. (1 December 2009)
2. Introduction to Strength of Material by U.C. Jindal, Pearson Education; Second edition (28 September 2017)
3. Strength of materials by R. Subramanian, Oxford university press, New Delhi, third edition (15 June 2016)

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET02
Name of the Course	**FLUID MECHANICS & HYDRAULICS**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon completion of the course, the student will be able to

- Understand the physical properties of fluids and their influences on fluid motion (K2)
- Calculate the forces acting on plane and curved surfaces and solve fluid flow problems in kinematics and dynamics (K3)
- Solve various laminar and turbulent flow problems (K2)
- Solve uniform and non uniform open channel flow problems (K2)
- Estimate the impact of jet on plane and curved surfaces using momentum Principle (K2)

SYLLABUS

UNIT I

Introduction and Hydrostatics: Dimensions and units – Physical properties of fluid specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion - pressure at a point, Pascal's law, hydrostatic law, atmospheric, gauge and vacuum pressure, measurement of pressure - pressure gauges, Manometers: Differential Manometers-Hydrostatic forces on submerged plane - Horizontal, Vertical, Center of pressure, derivations and problems.

UNIT II

Fluid Kinematics and Dynamics: Description of fluid flow - Stream line, path line and streak lines and stream tube - Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows - Surface and body forces - Euler and Bernoulli's equations for flow

UNIT III

Closed Conduit and Measurement of Flow: Laws of Fluid friction-Darcy's equation-Minor losses-pipes in series, pipes in parallel, Pipe network problem- variation friction factor with Reynolds's number- Pitottube,Venturi meter and Orifice meter - flow over rectangular, triangular and trapezoidal notches.

UNIT IV

Uniform Flow and Non Uniform Flow: Types of flows - Type of channels - Chezy's, manning's and Bazin formulae for uniform flow - Most Economical sections - Critical flow: Specific energy-critical depth computation of critical depth critical, sub-critical and super critical flows - Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes, surface profiles - direct step method - Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT V

Hydraulic Similitude and Momentum Principles: Dimensional analysis- Buckingham's-Pi theorem - study of hydraulic models-Geometric, Kinematic and Dynamic similarities-dimension less numbers, model laws-Hydrodynamic force of jets on stationary and moving flat-inclined and curved vanes-jet striking centrally and at tip- velocity triangles at inlet and outlet- expressions for work done and efficiency

Textbooks:
1. Hydraulics and Fluid Mechanics including Hydraulic Machines by Dr. P.N.Modiand Dr.S.N.Seth, Standard Book house, Rajsons Pvt.Ltd.,21stEdition.
2. A text book of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal,Laxmi Publications(P)Ltd.,NewDelhi,10thEdition,2018.
3. A text book of Fluid mechanics and Hydraulic machines by Er. R.K.Rajput, S.Chand&company,6thEdition,2016

References:
1. Introduction to Fluid Mechanics and Fluid Machines by S.K.Som, G.Biswas, Suman Chakraborthy, McGraw Hill Education, 3rd Edition,2017.
2. Fluid Mechanics by A.K.Mohanty, Prentice Hall of India Pvt. Ltd., NewDelhi,2nd Edition,1994.
3. Fluid Mechanics and Hydraulic Machines by K.Subramanya, McGraw Hill Education,1st Edition,2010.

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET03
Name of the Course	SURVEYING AND GEOMATICS					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course, the students will be able to

- Demonstrate the basic surveying skills (K2)
- Computation of bearings by various surveying instruments (K3)
- Perform different methods of leveling (K3)
- Compute various data required for various methods of surveying (K3)
- Compute area and volume quantities by different methods (K3)

SYLLABUS

UNIT I

Introduction: Definition-Uses of surveying- overview of plane surveying (chain, Compass and plane table), Objectives, Principles and classifications – Errors in survey Measurements

UNIT II

Compass survey and traversing: Electronic distance measurements (EDM)-principles of electro optical EDM-Errors and corrections to linear measurements- Compass survey-Meridians, Azimuths and Bearings, declination, computation of angle. Traversing-Purpose-types of traverse-traverse computation-traverse adjustments-Introduction omitted measurements

UNIT III

Leveling, Contouring and Curves: Concept and Terminology, Leveling Instrument and their Temporary and permanent adjustments- method of leveling. Characteristics and Uses of contours- methods of conducting contour surveys.Types of curves, design and setting out – simple and compound curves

UNIT IV

Theodolite Surveying: principles-uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Introduction to Trigonometrically leveling,. Tachometric Surveying: Stadia and tangential methods of Tacheometry. Distance and-Elevation formulae for Staff vertical position

UNIT V

Computation of Areas and Volumes: Area from field notes, computation ofareas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Geomatics: Introduction, Total Station and Global positioning system, Electromagnetic spectrum, Visual image interpretation, Digital image processing

Text Books:
1. Surveying, Vol No.1, 2 &3, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain –
2. Laxmi Publications Ltd, New Delhi,seventeenth edition (2016)
3. 2 Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing
4. Co. Ltd. New Delhi.Fourth edition (1 July 2017)
5. Text book of Surveying, Arora (Vol No. 1&2), STANDARD BOOK HOUSE SINCE 1960; Edition: Year-2015 edition (2015)
6. Anji Reddy, M., Remote sensing and geographical information system,BS Publications/BSP Books (2012)

References:
1. Text book of Surveying, C. Venkataramaiah, universities Press (India) Pvt. Ltd. (12 January 2011)
2. Surveying and levelling, R. Subramanian, Oxford University Press; 2 edition (30 June 2012)

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET04
Name of the Course	**BUILDING MATERIALS & CONCRETE TECHNOLOGY**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon completion of the course, the student will be able to

- Discuss the basic concepts of building materials (K2)
- Distinguish the basic ingredients of concrete and their role in the production of concrete and its behavior in the field (K2)
- Apply fundamental knowledge in the fresh concrete (K3)
- Apply fundamental knowledge in the hardened properties of concrete and factors (K3)
- Find test on hardened concrete and properties, evaluate the ingredients of concrete through lab test results and design the concrete mix by BIS method (K3)

SYLLABUS

Unit I (Stones, Bricks, Tiles, Wood and Paints)
Stones: Classification of Stones – Properties of stones in structural requirements
Bricks: Composition of good brick earth, Various methods of manufacturing of bricks
Tiles: Characteristics of good tile – Manufacturing methods, Types of tiles
Wood: Structure – Properties – Seasoning of timber – Classification of various types of woods used in buildings – Defects in timber
Paints: White washing and distempering, Constituents of paint – Types of paints – Painting of new and old wood – Varnish

Unit II (Aggregates, Cement and Admixtures)
Aggregates: Classification of aggregate, Bond, Strength and other mechanical properties of aggregate, Physical properties of aggregate, bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali-Aggregate reaction – Thermal properties, Sieve analysis – Fineness modulus – Grading curves – Grading of fine and coarse aggregates as per relevant IS code, Maximum aggregate size
Portland Cement: Chemical composition, Hydration, Structure of hydrated cement – Setting of cement, Fineness of cement, Tests for physical properties – Different grades of cements
Supplementary cementitious materials: Fly ash, GGBS, Silica fume, Rice husk ash, Calcinated ash (Basic properties and their contribution to concrete strength)
Admixtures: Mineral and Chemical admixtures

Unit III (Fresh Concrete)
Manufacture of concrete: Mixing and vibration of concrete, Workability – Segregation and bleeding – Factors affecting workability, Measurement of workability by different tests, Effect of time and temperature on workability – Quality of mixing water, Ready mix concrete, Shotcrete

Unit IV (Hardened Concrete)

Water / Cement ratio: Abram's law, Gel space ratio, Nature of strength of concrete – Maturity concept, Strength in tension and compression – Properties of Hardened Concrete (Elasticity, Creep, Shrinkage, Poisson's ratio, Water absorption, Permeability, etc.), Relating between compression and tensile strength, Curing

Unit V (Testing of Hardened Concrete, Mix Design)

Testing of Hardened Concrete: Factors affecting properties of Hardened concrete, Compression tests, Tension tests, Flexure tests, Non-destructive testing methods – Codal provisions for NDT – Rebound hammer and UPV method.

Mix Design: Factors in the choice of mix proportions – Quality Control of concrete - Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design.

Text Books:
1. "Concrete Technology" by M. S. Shetty - S. Chand & Co., 2004
2. "Engineering Materials" by Rangwala S C, (36th edition), Anand Charotar Publishing House
3. "Concrete Technology" by Shantha Kumar – Oxford Publications

Reference Books:
1. "Building Materials" by S. K. Duggal, New Age International Publications
2. "Building Materials" by P. C. Verghese, PHI learning (P) Ltd., 2009
3. "Properties of Concrete" by A. M. Neville – Pearson – 4th edition

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	0	0	3	1.5	V20CEL01
Name of the Course	**STRENGTH OF MATERIALS LAB**					
Branch	CIVIL ENGINEERING					

Course outcomes:

Upon completion of the course, the student will be able to

- Identify the engineering properties of materials in the laboratory
- Assess torsion test to determine elastic constants
- Assess spring test to determine elastic constants
- Assess flexural test to determine elastic constants
- Determine hardness of metals
- Determine Impact strength of metals

List of Experiments

1. Tension test on Steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Continuous beam – deflection test.

List of Major Equipment:

1. UTM for conducting tension test on rods
2. Steel beam for flexure test
3. Wooden beam for flexure test
4. Torsion testing machine
5. Brinnell's / Rock well's hardness testing machine
6. Setup for spring tests
7. Compression testing machine
8. Izod Impact machine
9. Shear testing machine
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	0	0	3	1.5	V20CEL02
Name of the Course	**SURVEYING LAB**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon completion of the course, the student will be able to

- Use different Survey instruments to collect filed data
- Calculate distances, levels and angles from collected data
- Transfer points on ground to drawing sheet
- Interpret survey data to compute areas and volumes by using different methods
- Prepare profile of land from the collected survey data

List of experiments:

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Finding the area of the given boundary using compass (Closed Traverse)
3. Plane table survey; finding the area of a given boundary by the method of Radiation
4. Plane table survey; finding the area of a given boundary by the method of intersection.
5. Fly leveling : Height of the instrument method (differential leveling)
6. Fly leveling: Rise and Fall method.
7. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
8. Theodolite Survey: Finding the distance between two inaccessible points.
9. One Exercise on Curve setting.
10. One Exercise on contours.
11. Determination of area using total station
12. Determination distance between two inaccessible points.
13. Introduction to GPS.

References:

1. Surveying Vol No.1, 2 &3 by Dr.B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain –Laxmi Publications, seventeenth edition (2016), New Delhi.
2. Text book of Surveying by S.K. Duggal (Vol No. 1&2), McGraw Hill Education; Fourth edition (1 July 2017), New Delhi.
3. Text book of Surveying,Dr.K.R.Arora (Vol No. 1&2), STANDARD BOOK HOUSE SINCE 1960; Edition: Year-2015 edition (2015), Delhi.

Year/Sem	III Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	0	0	3	1.5	V20CEL03
Name of the Course	**CONCRETE TECHNOLOGY LAB**					
Branch	CIVIL ENGINEERING					

Course outcomes:

Upon completion of the course, the student will be able to

- Find some properties of cement by consistency, fineness, setting times, specific gravity, soundness and compressive strength.
- Determine the workability of cement concrete by compaction factor, slump and Vee – Bee tests.
- Determine properties of self-compacting concrete by Slump cone, V funnel, L Box
- Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
- Determine the flakiness and elongation index of coarse aggregates.
- Determine the bulking of sand.
- Understand the non-destructive testing procedures on concrete

I. Tests on Cement

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement.
5. Compressive strength of cement.

II. Tests on Aggregate

1. Sieve Analysis and gradation chairs
2. Bulking of sand.
3. Bulk and compact densities of fine and coarse aggregates

III. Tests on Fresh Concrete

1. Slump test
2. Compact factor test
3. Vee-bee Test
4. Flow Table Test

Tests on Self Compacting Concrete

1. Slump cone
2. V funnel
3. L Box

IV. Tests on hardened concrete
1. Compression test on cubes & Cylinders
2. Flexure test
3. Splitting Tensile Test
4. Modulus of Elasticity

V. Non Destructive tests of concrete
1. Rebound hammer
2. Ultrasound pulse Velocity (UPV)

Text Books:
1. Concrete Technology, M. S. Shetty. – S. Chand & Company

References:
1. Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.

Codes for reference:
1. IS: 4031 – chemical analysis and tests on cement.
2. IS 650:1991 –Standards and testing
3. IS 383:1970- Specification for coarse & fine aggregate
4. IS 2386 (Part III) 1963- Methods of test for aggregate for specific gravity, density, voids, absorption & bulking
5. IS 516:1959- Specification for compressive strength, Flexural strength
6. IS 5816:1999-Method of test for splitting tensile strength of concrete.
7. IS 13311(Part 1):1992 Methods of non-destructive testing of concrete: Part 1 Ultrasonic pulse velocity.
8. IS 13311(Part 2):1992 Methods of non-destructive testing of concrete: Part 2 Rebound hammer.
9. IS 6461(Part 7):1973 Glossary of terms relating to cement concrete: Part 7 Mixing, laying, compaction, curing and other construction aspects.

IV SEMESTER – SYLLABUS

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET05
Name of the Course	ENGINEERING GEOLOGY					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to
- Relate the features of geological agents (K3)
- Employ different techniques to identify different types of minerals and rocks (K3)
- Interpret hazard zonaation with reference to secondary structures (K3)
- Review earthquakes and landslides and their resulting subsidence (K3)
- Examine the engineering geological conditions of the strata and its suitability to major projects like Dams, Tunnels and Reservoirs etc. (K3)

SYLLABUS

UNIT I
Introduction: Branches of geology, Importance of geology in Civil engineering with case studies. Physical Geology: Geological processes, Weathering, Erosion and Civil engineering importance of weathering and Erosion

UNIT II
Mineralogy: Definition of mineral, Importance of study of minerals, Significance of different physical properties in mineral identification, Study of physical properties, Structure and chemical composition of common rock forming and economic minerals viz. Feldspar, Quartz, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Apatite , Kyanite, Garnet, Beryl, Talc, Calcite, Dolomite, Pyrite, Hematite, Magnetite, Galena, Graphite, Magnesite, Bauxite and Clay minerals Petrology: Introduction, Civil Engineering importance of petrology, Definition of Rock, Rock cycle, Geological Classification of rocks Igneous Rocks: Forms, Structures and textures of igneous rocks, Megascopic description and civil engineering uses of Granite, Basalt, Dolerite, Pegmatite and Charnockite Sedimentary Rocks: Formation, Structures and textures of sedimentary rocks, Megascopic description and civil engineering uses of Laterite, Conglomerate, Sand stone, Lime stone and Shale Metamorphic Rocks: Types of metamorphism, Structures and textures of metamorphic rocks, Megascopic Description and Civil engineering uses of Gneiss, Schist, Quartzite, Marble and Slate

UNIT III
Structural Geology: Introduction, Out crop, Strike and dip, Causes for development of secondary structures, Classification of Structures associated with Folds, Faults, Joints, Unconformities and their Civil engineering importance

UNIT IV

Earthquakes: Classification and causes, Intensity and magnitude and their measuring scales, Effects of earthquakes, Seismic belts, Civil Engineering considerations in seismic areas, Seismic zones of India Land Slides: Classification, Causes and effects, Preventive measures of landslides Ground water: Introduction, Classification of rocks based on porosity and permeability, Types of aquifers, Effects of groundwater over draft

Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods

UNIT V

Dams & Reservoirs: Types of Dams, Geological considerations for the selection of dam sites, Stages of investigation, Case histories of few dam failures, Geology of few Indian dam sites
Tunnels: Purpose of Tunneling, Geological considerations for tunneling, Effects of tunneling, Over break, Geology of some tunnel sites

Textbooks:
1. A text Book of Engineering Geology by N. Chenna Kesavulu, Macmillan India Ltd., Delhi, second edition, 2009.
2. Principles of Engineering Geology by K M Bangar, Standard Publishers and Distributers, 2009.
3. Principles of Engineering Geology- K Gokhale, B. S. Publication, Revised Edition, 2010.

Reference Books:
1. Fundamentals of Engineering Geology, F.G.Bell, published by Butterworth-Heinemann, 1983.
2. Principles of Engineering Geology and Geotechnics by D P Krynine and W R Judd, CBS Publishers & Distribution, first edition, 2005.
3. Engineering Geology for Civil Engineers by D. Venkata Reddy, Oxford & IBM Publishing Company Pvt. Ltd., New Delhi, second edition, 2017.
4. Engineering and General Geology by Parbin Singh, Published by S. K. Kataria & Sons, New Delhi, 2013.
5. Engineering Geology and Rock Mechanics by Dr B.P.Varma, Khanna Publishers, Delhi, 1998.

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET06
Name of the Course	STRUCTURAL ANALYSIS-I					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon completion of the course, the student will be able to

- Illustrate Shear Force, Bending Moment and Deflection of Propped Cantilevers for different fixity conditions (K3)
- Calculate Shear Force, Bending Moment and Deflections of fixed beams for different fixity conditions (K3)
- Calculate Shear Force, Bending Moment and Deflections of Continuous beams for different fixity conditions (K3)
- Understand the concepts of Energy Theorems (K2)
- Assess Maximum Shear Force, Bending Moment and Deflections at a given section when loads of varying spans are passing over truss (K3)

SYLLABUS

UNIT I
Propped Cantilevers: Analysis of propped cantilevers-shear force and bending moment diagrams-Deflection of propped cantilevers..

UNIT II
Fixed Beams: Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

UNIT III
Continuous Beams: Introduction-Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed continuous beams with overhang, continuous beams with different moment of inertia for different spans Effects of sinking of supports-shear force and bending moment diagrams.

UNIT IV
Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem Deflections of simple beams and pin jointed trusses.

UNIT V
Moving Loads And Influence Lines: Introduction, influence line diagrams, influence line diagrams for simply supported beams, cantilever beams, overhanging beams, double overhanging beams, balanced cantilever beams, girder supporting floor beams, use of influence line diagrams, maximum SF and BM values for moving loads, Train of concentrated loads

Text Books:
1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.
3. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi.
4. Structural Analysis - Vol. I and II,S.S.Bhavikatti,Vikas Publishing House,New Delhi.

References:
1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications.
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai 5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli. Yesdee Publishing Pvt Limited, Chennai

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	3	0	0	3	V20CET07
Name of the Course	**WATER RESOURCES ENGINEERING**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Calculate average rainfall and check consistency, continuity of rainfall (K3)
- Estimate the different components of the hydrologic cycle (K2)
- Compute the runoff of a catchment using Hydrographs (K3)
- Compute the flood frequency, design flood, flood routing (K3)
- Discuss the concepts of groundwater movement and well hydraulics (K2)

SYLLABUS

UNIT I
Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological Data - sources of data. Precipitation: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm.

UNIT II
Abstractions from Precipitation: Initial abstractions. Evaporation: factors affecting, measurement, reduction Evapotranspiration: factors affecting, measurement, control Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT III
Runoff: Catchment characteristics, Factors affecting runoff, components, computation empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT IV
Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management. Flood Routing: Hydrologic routing, channel and reservoir routing- Muskingum and Puls methods of routing.

UNIT V
Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

Textbooks:
1. "Engineering Hydrology", Subramanya K., Tata Mc Graw-Hill Education Pvt. Ltd, New Delhi,2013.
2. "Engineering Hydrology", Jayarami Reddy P., Laxmi Publications Pvt. Ltd., New Delhi, (2013)
3. "Applied hydrology", Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011.

References:
1. "Water Resources Engineering", Mays L.W, Wiley India Pvt. Ltd, 2013.
2. "Hydrology", Raghunath. H.M., New Age International Publishers, 2010.
3. "Engineering Hydrology - Principles and Practice" Ponce V.M., Prentice Hall International,1994.
4. "Hydrology and Water Resources Engineering", Patra K.C., Narosa Publications, 2011.
5. "Engineering Hydrology", Ojha C.S., Berndtsson P.R and Bhunya. P., Oxford University Press,

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2020-2021	3	0	0	3	V20CET08
Name of the Course	**TRANSPORTATION ENGINEERING**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Design highway geometric elements for the decided alignment through engineering surveys (K3)
- Analyze and design of flexible, rigid pavements and examine pavement construction activities and also conduct quality control at site (K3)
- Analyze and design of traffic infrastructure facilities and evaluate pavement condition to suggest remedial measures (K3)
- Analyze the Railway Track Geometric Elements (K3)
- Analyze and design geometric elements of Airport Runway and Taxiway and classify the various components of Dock & Harbors (K3)

SYLLABUS

UNIT I
Highway Alignment and Geometric Design: Historical development of roads– Highway development in India –Different Road Development Plan– Highway Alignment– Factors affecting Alignment– Engineering Surveys. Highway Geometric Design: Importance of Geometric Design– Factors–Highway Cross Section Elements–Sight Distance Elements–Design of Horizontal Alignment–Design of Vertical alignment.

UNIT II
Design of Pavements and Highway Construction: Types of pavement– Components of pavement–Flexible Pavements – Design factors – Flexible Pavement Design Methods–Mechanistic method, Rigid Pavements– Design Considerations– wheel load stresses–Temperature stresses–Design of slabs– IRC method of rigid pavements–Highway Construction–Types of Highway Construction – Earthwork – Stabilization of soils–Construction of Bituminous Pavements –Construction of Cement Concrete Pavements

UNIT III
Highway Maintenance and Traffic Infrastructure Design: Pavement Failures – Pavement Condition Survey–Maintenance of Highways– Pavement evaluation– Strengthening of existing pavements– Traffic Engineering – Basic Parameters of Traffic– Volume,– Speed–Density- Volume Studies Speed Studies– spot speed– speed & delay studies, Parking Studies, Condition Diagram and Collision Diagrams-–PCU Factors –Capacity and LOS of Highways – Road Traffic Signs –Road markings – Types of Intersections– At-Grade Intersections–Design of Traffic Signals– Webster Method .

UNIT IV
Railway Engineering : Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings – Geometric Design of Railway Track: Gradients- Grade Compensation- Cant and Negative Super elevation- Cant

Deficiency –Degree of Curve , Layout of Railway stations and yards – Signals – Interlocking –Track layouts –Turnouts – Layout of Turnout – Crossings –Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signaling systems

UNIT V
Airport Planning and Docks Harbors: Airport Master plan – Airport site selection – Air craft characteristics –Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway – Terminal area. Docks Harbors: Layout of Port components – Functions –Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

Textbooks
1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros.,Roorkee.
2. Traffic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, New Delhi.
3. Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi.
4. Airport Engineering, Khanna & Arora , Nemchand Bros, New Delhi.
5. Docks and Harbor Engineering, Bindra S.P., Dhanpathi Rai & Sons, New Delhi.

References
1. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi.
2. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi
3. Transportation Engineering - An Introduction, Jotin Khisty C, Prentice Hall, Englewood Cliffs, New Jersey.
4. Railway Engineering, Saxena & Arora, Dhanpat Rai, New Delhi.
5. Airport Engineering Planning & Design, Subhash C. Saxena, CB Publishers, New Delhi.
6. Transportation Engineering, Railways, Airports, Docks & Harbors, Srinivasa Kumar R, University Press, Hyderabad.

IRC CODES
• IRC 37–2018: Guidelines for the Design of Flexible Pavements, Indian Road Congress Publications, New Delhi.
• IRC58–2015: Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Road Congress Publications, New Delhi.
• MORTH - Specifications for Road and Bridge works, Indian Road Congress Publication, New Delhi, Latest Edition.

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	0	0	3	1.5	V20CEL04
Name of the Course	**ENGINEERING GEOLOGY LAB**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon completion of the course, the student will be able to
- Understand the importance of geology in civil engineering
- Identify the geological process of any region to carry civil engineering works
- Evaluate the formation and properties of minerals, rocks and soil
- Develop the ability to prepare geological maps and sections to interpret site conditions

List of Experiments
1. Physical properties of minerals and their megascopic identification
2. Rock forming minerals: Quartz group, Feldspar group, Garnet group, Mica group, Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum etc.
3. Ore forming minerals: Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite etc.
4. Megascopic description and identification of rocks
5. Igneous rocks: Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
6. Sedimentary rocks: Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
7. Metamorphic rocks: Biotite, Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc.
8. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
9. Simple Structural Geology problems
10. Bore hole data
11. Strength of the rock using laboratory tests
12. Field work to identify Minerals and Rocks, Geomorphology and Structural Geology

References:
1. Applied Engineering Geology Practicals by M T Maruthesha Reddy, New Age International Publishers, Second Edition, 2007.
2. Foundations of Engineering Geology by F G Bell, B S Publications, first edition, 2005.

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	0	0	3	1.5	V20CEL05
Name of the Course	**FLUID MECHANICS & HYDRAULIC MACHINERY LAB**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon completion of the course, the student will be able to
- Employ the basic principles of Fluid mechanics to assess discharge with different devices and different losses in a pipe line (K3)
- Calculate the performance parameters of Reciprocating and Centrifugal pumps (K3)
- Calculate the performance parameters of different types of turbines (K3)

List of Experiments
1. Determination of friction factor for the given pipe line.
2. Determination of loss of head due to sudden contraction.
3. Determination of force exerted by a jet on a vane.
4. Calibration of Venturimeter.
5. Calibration of Orificemeter.
6. Calibration of Turbine flow meter.
7. Determination of performance parameters of Reciprocating pump.
8. Determination of performance parameters of Single stage Centrifugal pump.
9. Determination of performance parameters of Multi stage Centrifugal pump.
10. Determination of performance parameters of Pelton wheel.
11. Determination of performance parameters of Francis Turbine.
12. Determination of performance parameters of Kaplan Turbine.

Add On Experiments:
1. Determination of loss of head due to sudden expansion.
2. Verification of Bernoulli's theorem.

References:
1. Fluid Mechanics and Fluid Machines lab – College lab manual.
2. Hydraulics And Fluid Mechanics Including Hydraulics Machines (In Si Units) – Modi & Seth,20th edition, Standard publishers, 2015.

Year/Sem	IV Sem	L	T	P	C	COURSE CODE
Regulation / Year	V20 / 2021-2022	0	0	3	1.5	V20CEL06
Name of the Course	**TRANSPORTATION ENGINEERING LAB**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the student will be able to
- Assess the suitability of different materials for the road construction (K3)
- Examine the given bitumen samples and judge their suitability for road construction (K3)
- Find the Optimum Bitumen content for the Bituminous mix (K3)
- Develop the gradation of Bituminous mix for stability and flow properties (K3)

List of Experiments
I. Road Aggregates:
   1. Aggregate Crushing value
   2. Aggregate Impact Test.
   3. Specific Gravity and Water Absorption.
   4. Abrasion Test.
   5. Shape tests
II. Bituminous Materials:
   6. Penetration Test.
   7. Ductility Test.
   8. Softening Point Test.
   9. Flash and fire point tests.
   10. Viscosity Test.
III. Bituminous Mix:
   11. Marshall Stability test.

List of Equipment
   1. Apparatus for aggregate crushing test.
   2. Aggregate Impact testing machine
   3. Pycnometers.
   4. Los angles Abrasion test machine
   5. Length and elongation gauges
   6. Bitumen penetration test setup.
   7. Bitumen Ductility test setup.
   8. Ring and ball apparatus
   9. Flash and Fire Apparatus
   10. Viscometer.
   11. Marshal Stability apparatus.

References:
   1. "Highway Material Testing Manual", S.K. Khanna, C.E.G Justo and A.Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.
   2. IRC Codes of Practice
   3. Asphalt Institute of American Manuals
   4. Code of Practice of B.I.S.

ANNEXURE – II
SYLLABI OF V to VIII SEMESTERS OF B.TECH COURSES FOR THE ACADEMIC YEAR 2022-23 & 2023-24

V SEMESTER – SYLLABUS

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET09
Name of the Course	STRUCTURAL ANALYSIS – II					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Compute the moments and reactions for two hinged and three hinged arches (K3)
- Analyze the continuous beams using Moment distribution and Kani's methods (K4)
- Assess the load distribution in different components of Suspension bridges (K3)
- Analyze the structure for Lateral loads using different methods (K4)
- Compute the moments and forces using matrix methods (K3)

SYLLABUS

UNIT I
Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature, Hinges with support at different levels.
Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses.

UNIT II
Moment Distribution Method: Introduction Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports.
Kani's Method: Introduction – Rotational factor, Analysis of continuous beams – including settlement of supports.

UNIT III
Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge.

UNIT IV
Lateral Load Analysis on Frames: Approximate Methods, Portal Method and Cantilever Method, Computational techniques, algorithms.

UNIT V
Introduction to Matrix Methods: Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns). Stiffness method: Introduction, application to continuous beams (maximum of two unknowns).

Text Books:
1.   Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.
2.   Structural Analysis, R.C. Hibbeler, Pearson Education, India
3.   Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.
4.   Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.
5.   Structural Analysis - Vol. I and II,S.S.Bhavikatti,Vikas Publishing House,New Delhi.

References:
1.   Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India
2.   Theory of structures, Ramamuratam, Dhanpatrai Publications.
3.   Analysis of structures, Vazrani & Ratwani – Khanna Publications.
4.   Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi
5.   Structural Analysis I, P.N. Chandramouli. Yesdee Publishing Pvt Limited
6.   Structural Analysis, Aslam Kassimali, Cengage Learning
7.   Matrix Methods of Structural Analysis, P.N. Godbole, R. S. Sonaparote, PHI Learning Pvt Limited

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET10
Name of the Course	**GEOTECHNICAL ENGINEERING**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to
- Develop the inter-relationships between various parameters of the soils (K3)
- Assess the permeability of soils having different properties (K3)
- Employ different methods to know the stress distribution in soils (K3)
- Interpret different parameters related to compaction and consolidation of soils (K3)
- Examine the stress strain behavior of soils under various drainage conditions (K3)

SYLLABUS

UNIT I
Soil Properties and Classification: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density, Index Properties of Soils, Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

UNIT II
Permeability: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses – quick sand condition – 2-D flow and Laplace's equation - Seepage through soils – Flow nets: Characteristics and Uses.

UNIT III
Stress Distribution in Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark'sinfluence chart – 2:1 stress distribution method.

UNIT IV
Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.
Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (cv) - Over consolidated and normally consolidated clays.

UNIT V
Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-

Strain behavior of clays – Shear Strength determination- various drainage conditions.

Text Books:
   1."Basic and Applied Soil Mechanics", Gopal Ranjan and A. S. R. Rao, New Age International Publishers.
   2."Soil Mechanics and Foundation Engineering", V. N. S. Murthy, CBS publishers.
   3."Soil Mechanics and Foundations", B.C. Punmia, Laxmi Publications.

References:
   1."Fundamentals of Soil Mechanics", D. W. Taylor, Wiley.
   2."An introduction to Geotechnical Engineering", Holtz and Kovacs; Prentice Hall.
   3."Fundamentals of Geotechnical Engineering", B M Das, Cengage Learning, New Delhi**.**

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET11
Name of the Course	DESIGN OF REINFORCED CONCRETE STRUCTURES					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to

- Design the beams in working stress and limit state methods (K5)
- Design the doubly reinforced and flanged (T and L) beam sections for flexure (K5)
- Design the continuous beams for shear and bond (K5)
- Design the one way, two way slabs and stair case of buildings (K5)
- Design the columns and footings of the structures (K5)

SYLLABUS

UNIT I
Introduction of Reinforced concrete: Structural elements- Loads on structures- Strength and serviceability - Methods of design - Working stress method- design constants - neutral axis - moment of resistance for different sections- Design of singly beams- Concepts of limit state design - Partial load and safety factors - stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance. Codes of practice.

UNIT II
Design for Flexure: Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behavior- Analysis and Design.

UNIT III
Design for Shear and Bond and continuous beams: Limit state analysis and design of section for shear – concept of bond, anchorage and development length, I.S. code provisions.
Design examples in simply supported and continuous beams, detailing. Limit state design for serviceability: Deflection, cracking and code provision.

UNIT IV
Slabs: Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) – Design of two - way slabs-simply supported and various edge conditions using IS Coefficients, Design of Stair Case.

UNIT V
Design of Compression members and footings: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – IS Code provisions.
Footings: Different types of footings – Design of isolated footings – square, rectangular.

NOTE:
All units i.e. from unit II to unit VI are to be taught in Limit State Design.
Following sheets should be prepared by the students.
Sheets-1   Reinforcement detailing of T-beams, L-beams and continuous beams.
Sheets-2   Reinforcement detailing of beam with all details.
Sheets-3   Detailing of one-way, two-way and continuous slabs.
Sheets-4   Reinforcement detailing of columns.
Sheets-5   Reinforcement detailing of isolated footings.

Examination Pattern:
Internal Examination Pattern:
The total internal marks are distributed in three components as follows:
Descriptive (subjective type) examination   : 15 marks
Detailing sheets(For above)   : 10 marks
Assignment   : 05 marks

Text Books:
1.   "Limit State Design", A. K. Jain
2.   "Design of Reinforced concrete Structures", N. Subrahmanyian.
3.   "Reinforced concrete", Vol.1., H. J. Shah, Charotar publishing house Pvt. Ltd.

References:
1.   "R C C Design", B.C Punmia, A. K. Jain and A. K Jain. Lakshmi Publications
2.   "Reinforced Concrete Structures", N. Krishna Raju and R. N. Pranesh, New Age
        Publications.
3.   "Reinforced Concrete Structures", S. Unnikrishna Pillai and Devdas Menon, Tata
        Mc.Graw Hill, New Delhi.
4.   IS 456-2000, Code of practice for Reinforced Concrete Structures.
5.   IS 875, Code of Practice for Design Loads.
6.   SP-16, Design Aids for Reinforced Concrete.

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET12
Name of the Course	**ADVANCED CONCRETE TECHNOLOGY (Professional Elective -1)**					
Branch	CIVIL ENGINEERING					

Course Outcomes
Upon successful completion of course the students will be able to
- Relate the material characteristics and their influence on concrete (K3)
- Predict concrete behavior based on its durability properties (K3)
- Illustrate mix proportioning of different types of concretes and their testing (K3)
- Select the suitable concrete based on their specific application (K3)
- Employ suitable concreting methods to place the concrete based on requirement (K3)

SYLLABUS

UNIT I
Ingredients of Concrete: Cement –chemical composition and their importance, hydration of cement, types of cement, testing of cement.
Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing.
Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate, testing on aggregate, requirement, Recycled aggregates Water – qualities of water.
Chemical admixtures: Plasticizers, accelerators, retarders and air entraining agents.
Mineral admixtures: Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash, Green concrete.

UNIT II
Durability of Concrete: Durability, Transport mechanism of fluids and gases in concrete, cracking in concrete - corrosion and carbonation induced cracking, Alkali Aggregate Reaction, degradation by freeze and thaw, chloride attack, sulphate and sea water attack (marine conditions). Hot and cold weather concreting, water penetration and rapid curing tests.

UNIT III
Concrete Mix Design: Design of concrete mixes by IS code method - ACI method Design of high strength concrete mixes, design of fly-ash cement concrete mixes, design of high density concrete mixes.
Testing of Concrete: Test methods: Analysis of fresh concrete, Accelerated testing methods, Tests on hardened concrete, Core cutting and testing, partially destructive testing, Non-destructive testing of concrete structure

UNIT IV
Special Concrete: Lightweight concrete, autoclaved aerated concrete, no-fines concrete, lightweight aggregate concrete and foamed concrete, High strength concrete, refractory concrete, high density and radiation-shielding concrete, polymer concrete, fibre-reinforced concrete, mortars, renders, recycled concrete, Ferro Cement, Self Compacting Concrete.

UNIT V
Special processes and technology for particular types of structure: Sprayed concrete, underwater concrete, grouts, grouting and grouted concrete, mass concrete, slip form construction, pumped concrete, concrete for liquid retaining structures, vacuum process

Text Books:
1. Neville, A.M., Properties of Concrete, Pearson Education Asia (P) Ltd, England, 2000.
2. Concrete Technology, Gambhir M.L, Tata McGraw Hill
3. Concrete Technology, M.S.Shetty, S.Chand& Company New Delhi
4. Concrete microstructure, properties & materials, P.Kumar Mehata, Paulo & J.M. Monteiro,
5. Light Weight Concrete, Short & Kenniburg, Asia Publishing House, Bombay

References:
1. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
2. Job Thomas, "Concrete Technology", CENGAGE Learning,2015.
3. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete BMTPC.
4. Specification and Guidelines for Self-Compacting Concrete, EFNARC, Association House.

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET13
Name of the Course	**IRRIGATION ENGINEERING (Professional Elective -1)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of the course, the student will be able to**:**
- Interpret the quality of irrigation water and water requirements (K2)
- Design the erodible and non-erodible canals using different theories (K5)
- Asses different irrigation canal structures (K3)
- Relate the diversion head works and their components (K3)
- Analyze the stability of Gravity and Earth dams (K3)

SYLLABUS

UNIT I
Irrigation & Water Requirements: Definition – Importance of Irrigation in India – Advantages and Dis advantages – Types of Irrigation – Quality of Irrigation water - Different types of crops and crop seasons- Soil, water and plant relationship- Irrigation efficiencies -Crop water requirement-Duty and Delta-Factors affecting duty-Depth and Frequency of Irrigation-crop rotation.

UNIT II
Canals: Classification-Alluvial and Non Alluvial canals-Design of non-erodible canals-Different command areas-Methods of economic section and maximum permissible velocity-Design of erodible canals-Kennedy's silt theory and Lacey's regime theory.

UNIT III
Canal structures: Falls-Types and location- Design principle of Sarda type wall and straight glacis wall
Regulators: Head and cross regulators –design principles
Cross Drainage works: Design principles of aqueduct- siphon aqueduct-super passage

UNIT IV
Diversion Head Works: Types of diversion head works-Weirs and Barrages-Layout of diversion head works-components- causes and failures of weirs on permeable foundations-Bligh's creep theory-Khosla's theory-exit gradient.

UNIT V
Reservoir planning: Site selection-Types of dams- selection of type of dam- selection of site for a dam.
Gravity Dams: Forces acting on gravity dam-causes of failure of gravity dam- elementary profile and practical profile of gravity dam-limiting height of dam- stability analysis-drainage galleries.

Earthen Dams: Types of earthen dams-causes of failure-criteria for safe design-seepage-measures of control of seepage filters.

Text Books:
1. Irrigation Engineering and Hydraulic structures, Santosh Kumar Garg, Khanna Publishers.
2. Irrigation and Water power Engineering, B.C. Punmia, Pande B.B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications Ltd.
3. Water resources and Irrigation engineering by Sri Krishna publications.

References:
1. Irrigation and Water Resources Engineering, Asawa G L (2013), New Age International Publishers.
2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard book House, New Delhi.
3. Irrigation and Drainage Engineering" by Peter Waller and Muluneh Yitayew

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET14
Name of the Course	**TRAFFIC ENGINEERING AND MANAGEMENT (Professional Elective –I)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of the course the student will be able to:

- Understand basics principles of Traffic Engineering (K2)
- Analyze parking data and model accidents (K3)
- Determine traffic capacity and level of service (K3)
- Design of Signalized systems and Rotary Intersections (K5)
- Employ engineering techniques to achieve safe and efficient movement of people
  and goods on roadways (K3)

SYLLABUS

UNIT I
Traffic Studies (Part- I) : Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.

UNIT II
Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking
inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data;   Parking   Management
Accident studies - Causative factors of Road accidents, Accident data collection: Road Safety Auditing, Measures to increase Road safety. Pedestrian studies, Bicycle path studies, sky walk planning.

UNIT III
Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS as per Indo-HCM,Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments-Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.

UNIT IV
Design of Signal and Intersections: Fixed Time signals, Determination of Optimum Cycle length and Signalsetting for Fixed Time signals, Flexible progressive system, Warrants for Signals, Signal Coordination.
Rotary planning , Rotary Design as per IRC:65, Weaving angles, Entry width, Exit Radius, Capacity of Rotary, Types of interchanges, Implementation.

UNIT V

Transportation System Management: Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Reversible lanes - Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

Text Books:
1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter
   Kilareski, John Wiley & Sons Publication.
3. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall
   Publication.

References:
1. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.
2. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall
    Publication.
3. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas ,
   Prentice Hall, 1977.
4. IRC-65-2017: Guidelines for Planning and Design of Roundabouts (First Revision)
5. IRC-93-1985: Guidelines for design and installation of road traffic signals
6. Indian Highway capacity manual (Indo-HCM) – 2017, Published by CSIR-CRRI, New   Delhi.

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET15
Name of the Course	**AIR POLLUTION AND CONTROL (Professional Elective –I)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to:
- Asses the pollutants and ambient quality of air (K3)
- Illustrate the plume behavior in a prevailing environmental condition (K3)
- Examine carbon credits for various day to day activities(K3)
- Select proper technique to control the air particulates (K3
- Choose appropriate in plant control measures for different emissions (K3)

SYLLABUS:

UNIT I
Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into µg/m3. Definition of terms related to air pollution and control - secondary pollutants – Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT II
Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams and Isopleths Plume Rise Models

UNIT III
Ambient Air Quality Management: Monitoring of SPM - RPM SO2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring – Noise Monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion

UNIT IV
Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators

UNIT V
Air Pollution Control Methods: Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

Text Books:
   1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, New Delhi,
      2015

2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

3. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson

Education.

References:

1. An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.

2. Air Pollution by Wark and Warner - Harper & Row, New York.

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET16
Name of the Course	GEO-ENVIRONMENTAL ENGINEERING (Professional Elective –I)					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Identify the Geo-environmental pollutants and their governing factors (K2)
- Employ the techniques for safe disposal of waste (K3)
- Relate the sub surface contamination transport (K3)
- Practice the utilization of solid waste for soil stabilization (K3)
- Select different remediation techniques to improve contaminated soil (K3)

SYLLABUS
UNIT I
Introduction to Geo Environmental Engineering: Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals - Failures of foundation due to waste movement.

UNIT II
Safe Disposal of Waste: Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

UNIT III
Transport Of Contaminants : Contaminant transport in sub surface - Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

UNIT IV
Stabilization: Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – case studies.

UNIT V
Remediation of Contaminated Soils: Exsitu and Insitu remediation- Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

Text Books:
1. Hari D. Sharma and Krishna R. Reddy, "Geo-Environmental Engineering" – John Wiley and
   Sons, INC, USA, 2004.
2. Daniel B.E., "Geotechnical Practice for waste disposal", Chapman & Hall, London 1993.

3.   Manoj Datta," Waste Disposal in Engineered landfills", Narosa Publishing House, 1997.

4.   Manoj Datta, B.P. Parida, B.K. Guha, "Industrial Solid Waste Management and Landfilling
       Practice", Narosa Publishing House, 1999.

References

1. Westlake, K, "Landfill Waste pollution and Control", Albion Publishing Ltd., England, 1995.
2. Wentz, C.A., "Hazardous Waste Management", McGraw Hill, Singapore, 1989
3. Proceedings of the International symposium on "Environmental Geotechnology" (Vol.I and II).
   Environmental Publishing Company, 1986 and 1989.
4. Ott, W.R., "Environmental indices, Theory and Practice", Ann Arbor, 1978.
5. Fried, J.J., "Ground Water Pollution", Elsevier, 1975.
6. ASTM Special Tech. Publication 874, Hydraulic Barrier in Soil and Rock, 1985.
7. Lagrega, M.D., Buckinham, P.L. and Evans, J.C., "Hazardous Waste Management" McGraw
   Hill Inc. Singapore, 1994.

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CEL07
Name of the Course	**GEOTECHNICAL ENGINEERING LAB**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Employ index properties required for classification of soils (K3)
- Find the permeability of different soils using different tests (K3)
- Predict the compaction, consolidation and swelling characteristics of the soils (K3)
- Compute the strength properties of soils (K3)

List of Experiments
1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Hydrometer Analysis Test
6. Permeability of soil - Constant and Variable head tests
7. Compaction test
8. Consolidation test (to be demonstrated)
9. Direct Shear test
10. Triaxial Compression test (UU Test)
11. Unconfined Compression test
12. Vane Shear test
13. Differential free swell (DFS)
14. CBR Test

List Of Equipments
1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
   a) Core cutter method
   b) Sand replacement method
4. Set of sieves: 4.75 mm, 2 mm, 1 mm, 0.6 mm, 0.42 mm, 0.3 mm, 0.15 mm, and
      0.075 mm.
5. Hydrometer
6. Permeability apparatus for
a) Constant head test
b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test

10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity

11. One dimensional consolation test apparatus with all accessories.

12. Triaxial cell with provision for accommodating 38 mm dia specimens.

13. Box shear test apparatus

14. Laboratory vane shear apparatus.

15. Hot air ovens (range of temperature 500 - 1500C

References:

1. Determination of Soil Properties, J. E. Bowles.
2. IS:2720 – Relevant Parts of Bureau of Indian Standards, New Delhi.

Sem	V Sem	L	T	P	C	COURSE CODE
Regulation Year	V203	0	0	3	1.5	V20CEL08
Name of the Course	**STRUCTURAL DETAILING USING AUTO CAD**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to
- Employ detailing of different building components (K3)
- Employ detailing of retaining walls (K3)
- Employ detailing of water tanks (K3)
- Employ detailing of septic tank (K3)

AutoCAD (2 Drafting)

1. Detailing of slab (One way & two way slabs)
2. Detailing of stair case (dog legged stair case)
3. Detailing of foundation (isolated, combined foundation)
4. Detailing of beams and columns in frame
5. Detailing of retaining wall (gravity)
6. Detailing of column base
7. Detailing of roof truss (king and queen post)
8. Detailing of box culvert
9. Detailing of water tank
10. Detailing of septic tank

VI SEMESTER – SYLLABUS

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET17
Name of the Course	**DESIGN OF STEEL STRUCURES**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Design the riveted, bolted and welded connection (K5)
- Design the beams against deflection, shear, buckling, and bearing (K5)
- Design of tension, compression and roof trusses for different loading conditions (K5)
- Design the compression members and column foundations (K5)
- Design the plate girder and gantry girder (K5)

SYLLABUS

UNIT I
Connections: Introduction - Properties of structural steel - IS Rolled sections - I.S Specifications - Lap and Butt connections (Revited and Bolted connections) - Eccentric connections.
Welded connections: Introduction - Advantages and disadvantages of welding- Strength of welds - Butt and fillet welds - Permissible stresses - IS Code requirements - Design of Butt and fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT II
Beams: Allowable stresses - Design requirements as per IS Code-Design of simple and compound beams - Curtailment of flange plates - Beam to beam connection - check for deflection, shear, buckling, and bearing - Design of laterally unsupported beams.

UNIT III
Tension Members: Introduction to different modes of failures - gross section yielding - Net Section rupture and block shear failure - Determine the design strength due to yielding of gross section - rupture of critical section and block shear - Design of tension members.
Compression Members: Effective length of columns - Slenderness ratio - permissible stresses - Design of compression members, Design of Struts.
Roof Trusses: Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints.

UNIT IV
Built up compression members: Design of lacings and battens. Design Splicing of columns.

Design of Column Foundations: Introduction - Design of slab base - Design of gusset base- Column bases subjected to moment.

UNIT V
Design of Plate Girder: Introduction - Design consideration - IS Code recommendations - Design of plate girder - Welded -curtailment of flange plates and stiffeners - splicing and connections.
Design of Gantry Girder: Introduction - Impact factors - longitudinal forces- Design of Gantry girders.

NOTE:
All units i.e. from unit II to unit-VI to be taught in Limit State method only. Welding Connections should be used from Unit II – Unit V.
The students should prepare the following sheets.
Sheets-1   Detailing of steel members Connection.
Sheets-2   Detailing of beams including curtailment of flange plates.
Sheets-3   Detailing of Column including lacing and battens.
Sheets-4   Detailing of Column bases, slab base and gusseted base.
Sheets-5   Detailing of Plate girder including curtailment, splicing and stiffeners.

EXAMINATION PATTERN:
Internal Examination Pattern:
The total internal marks are distributed in three components as follows:

Descriptive (subjective type) examination   : 15 marks
Detailing sheets(For above)   : 10 marks
Assignment   : 05 marks

Text Books:
   1.   Design of steel structures, S.K. Duggal, Tata McGraw Hill, and New Delhi.
   2.   Design of steel structures, S.S.Bavakatti, I.K.International Publishing House Pvt. Ltd.
   3.   Steel Structures Design and Practice, N.Subramanian, Oxford University Press.
   4.   Design of Steel Structures, Ramachandra, Scientific Publishers Journals Dept.

References:
   1.   Structural Design in Steel, Sarwar Alam Raz, New Age International Publishers, New
        Delhi.
   2.   Design of Steel Structures, P. Dayaratnam, S. Chand Publishers.
   3.   Design of Steel Structures, M.Raghupathi, Tata Mc. Graw-Hill.
   4.   Structural Design and Drawing, N. Krishna Raju, University Press.
   5.   IS: 800- 2007, General construction in steel-Code of practice.
   6.   IS: 875-1987, Code of Practice for Design Loads.
   7.   Steel Tables

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET18
Name of the Course	**FOUNDATION ENGINEERING**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to

- Employ the soil exploration and carryout the field testing (K3)
- Examine the slope stability and earth pressures using different theories (K3)
- Determine the bearing capacity of shallow foundations using bearing capacity criteria (K4)
- Determine the bearing capacity of shallow foundations using settlement criteria (K4)
- Design the deep foundations for different loading and soil conditions (K5)

SYLLABUS

UNIT I
Soil Exploration: Need, Methods of soil exploration – Boring and Sampling methods, Field tests, Penetration Tests, Pressure meter, planning of programme and preparation of soil investigation report.

UNIT II
Slope Stability: Infinite and finite earth slopes in sand and clay, types of failures, factor of safety of infinite slopes, stability analysis by Swedish arc method, standard method of slices ,Taylor's Stability Number, Stability of slopes of dams and embankments – different conditions.
Earth-Pressure theories: Rankine's& Coulomb's theory of earth pressure, Culmann's graphical method, earth pressures in layered soils.

UNIT III
Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location , Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity, analytical methods to determine bearing capacity – Terzaghi's theory ,IS Methods.

UNIT IV
Shallow Foundations – Settlement Criteria: Safe bearing pressure based on N-value, allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT V
Deep Foundations: Pile foundation, Types of piles, Load carrying capacity of piles based on static pile formulae, Dynamic pile formulae, Pile load tests, Load carrying capacity of pile groups in sands and clays.

Well Foundations: Types, Different shapes of well, Components of well–functions, forces acting on well foundations, Design Criteria –Determination of staining thickness and plug - construction and Sinking of wells, Tilt and shift.

Text Books:
1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengage learning.
2. Basic and Applied Soil Mechanics, Gopal Ranjan& A.S.R. Rao, New Age International Pvt. Ltd, (2004).
3. Soil Mechanics and Foundations, B.C.Punmia, Laxmi Publictions.

References:
1. Foundation Analysis and Design, Bowles, J.E., McGraw-Hill Publishing Company, Newyork.
2. Theory and Practice of Foundation Design, N.N.SOM & S.C.DAS PHI Learning Private limited.

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET19
Name of the Course	**ENVIRONMENTAL ENGINEERING**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- Clarify the protected water supply systems and their importance (K2)
- Assess different sources of water and proper intake structures (K3)
- Select suitable primary treatment process based on the quality of raw water (K3)
- Select suitable secondary treatment process (K3)
- Employ proper distribution system (K3)

UNIT I
Protected Water Supply systems: Importance and Necessity, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities. Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting

UNIT II
Sources of Water: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries. Collection and Conveyance of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits.

UNIT III
Quality Analysis and Primary Treatment of Water: Characteristics of water– Physical, Chemical and Biological- Analysis of Water – Physical, Chemical and Biological characteristics.
Flowchart of water treatment plant, Primary Treatment methods - Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation

UNIT IV
Secondary Treatment of Water: Filtration – types of filters – Design and working principles; Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and Manganese removal –

Adsorption-fluoridation and deflouridation–aeration– Reverse Osmosis-Iron exchange–Ultra filtration.

UNIT V

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, water meters and Pipes –Laying and testing of pipe lines-selection of pipe materials, pipe joints.

Text Books:

   1. Elements of Environmental Engineering by K.N. Duggal, S. Chand Company Ltd., New Delhi, 2012.
   2. Water Supply Engineering by Dr. P.N. Modi, Standard book house, 4th edition (2015)
   3. Water Supply Engineering by B.C. Punmia, Laxmi publications, volume-I
   4. Water supply and sanitary engineering by S. C. Rangwala, Charotar publishing house, 29th edition (2016)

References:

   1. Water supply engineering by S. K. Garg , Khanna publishers, ,33rd edition (2010)
   2. Environmental Engineering by Howard S. Peavy, Donald R. Rowe (2017) Mc-Graw-Hill Book Company, New Delhi, 1985.
   3. IS 10500:2012, Drinking water specification.
   4. IS: 3052 (Part-08), Methods of sampling and Test (physical and chemical) for water and wastewater.

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET20
Name of the Course	**BRIDGE ENGINEERING (Professional Elective - II)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion the course the student will be able to
- Generalize different types of bridges, loading standards and end conditions (K2)
- Assess different reactions and moments in the T beam bridge (K3)
- Design of pier and abutment caps of bridges (K5)
- Design of well foundation with different parameters of sub soil (K5)
- Outline the effectiveness of different bearings of a bridge (K4)

UNIT I

Introduction: Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT II

T-Beam Bridge: Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; Design of simply supported T-beam bridge.

UNIT III

Sub Structure for Bridges: Pier and abutment caps; Materials for piers and abutments, Design of pier; Design of abutment; Backfill behind abutment; approach slab.

UNIT IV

Foundations for Bridges: scour at abutments and piers; Grip length; Types of foundations; Design of well foundation.
Box Culverts: Loading – Analysis and Design- Reinforcement detailing

UNIT V

Bearings for Bridges: Importance of bearings; bearings for slab bridge; bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

Text Books:
1. Essentials of Bridge Engineering by Dr. Johnson Victor; Oxford & IBH publishing Co. Pvt.Ltd
2. Cable supported bridges, concepts and design by N J Gimsing. John Willey and Sons

3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

References:
1. Design of Bridge Structures by T. R Jagadeesh, M.A Jayaram, Prentice Hall of India Pvt. Ltd.
2. Design of Concrete Bridges, Aswini, Vazirani, Ratwani
3. Bridge Engineering by S.Ponnuswamy

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET21
Name of the Course	**EARTH RETAINING STRUCTURES (Professional Elective – II)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to
- Compute the lateral earth pressures associated with different earth systems (K3)
- Assess the failure criterion and stability requirements of retaining wall (K3)
- Analyze the sheet pile structure for both external and internal stability (K4)
- Apply the knowledge of reinforced earth in designing earth retaining systems (K3)
- Relate different methods for the stability of braced cuts and cofferdams (K3)

SYLLABUS

UNIT I
Earth pressures: Different types and their coefficients; Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure; Computation of Lateral Earth Pressure in Homogeneous and Layered soils; Graphical solutions for Coulomb's Theory in active and passive conditions.

UNIT II
Retaining walls: Types, Type of Failures of Retaining Walls – Stability requirements –Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT III
Sheet Pile Structures: Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and Fixed earth support methods – Rowe's moment reduction method – Location of anchors and Design of Anchorage system.

UNIT IV
Soil reinforcement: Reinforced earth - Different components – their functions – Design principles of reinforced earth retaining walls.

UNIT V
Braced cuts and Cofferdams: Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – Types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects – TVA method and Cummins' methods.

Text Books:
1. Principles of Foundation Engineering by Braja M Das, Cengage Learning
2. Foundation analysis and design by Bowles, J.E., McGraw Hill
3. Soil Mechanics in Engineering Practice – Terzaghi, K and Ralph B. Peck, John Wile & Sons.

References:
1. Earth Pressure and Earth Retaining Structures by Chris RI Clayton, Rick I woods, Andrew J Bond and Jarbas Milititsky, CRC Press, Taylor and Francis Group, New York.
2. Analysis and Design of Foundations and Retaining Structures, Samsher Prakash
3. Gopal Ranjan and Swami Saran, Saritha Prakashan Publishers, New Delhi.
4. NPTEL course materials on Geo-synthetics and Earth Retaining Structures

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET22
Name of the Course	**URBAN HYDROLOGY & HYDRAULICS (Professional Elective – II)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to
- Develop the drainage systems corresponding to the trends in urbanization (K3)
- Assess the urban drainage flow pattern (K3)
- Select suitable elements of drainage system (K3)
- Relate the detention and retention facilities of storm water (K3)
- Prepare typical drainage master plan for an urbanized area (K3)

SYLLABUS

UNIT I
Introduction: Urbanization and its effect on water cycle – urban hydrologic cycle – Trends in urbanization – Effect of urbanization on hydrology
Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, design storms for urban drainage systems.

UNIT II
Approaches to urban drainage: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse, major and minor systems.

UNIT III
Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control.

UNIT IV
Analysis and Management: Storm water drainage structures, design of storm water network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

UNIT V
Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, use of models in planning.

Text Books:
1. Manual on Drainage in Urbanised area, Geiger W. F., J Marsalek, W. J. Rawls and F.C. Zuidema, (1987 - 2 volumes), UNESCO,
2. Urban Hydrology, Hall M J (1984), Elsevier Applied Science Publisher.
3. Hydrology – Quantity and Quality Analysis, Wanielista M P and Eaglin (1997), Wiley and Sons

4. Urban Hydrology, Hydraulics and Storm water Quality: Engineering Applications and Computer Modelling, Akan A.O and R.L. Houghtalen (2006), Wiley International.

References:
1. Storm water Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO, Paris(http://www.bvsde.paho.org/bvsacd/ cd63/149460E.pdf)
3. Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET23
Name of the Course	**PAVEMENT ANALYSIS AND DESIGN** **(Professional Elective – II)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Employ different factors influencing the flexible pavement design (K3)
- Employ different factors influencing the rigid pavement design (K3)
- Analyze stresses and strains in flexible and rigid pavement using different theories (K3)
- Design a flexible pavement using Asphalt Institute, and AASHTO methods (K5)
- Design a rigid pavement using AASHTO methods (K5)

SYLLABUS

UNIT I

Factors Affecting Flexible Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT II

Factors Affecting Rigid Pavement Design: Rigid pavement layers**,** Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure,

UNIT III

Stresses in Flexible and Rigid Pavement: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts, Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, and Stresses in Dowel Bars & Tie Bars

UNIT IV

Design of Flexible Pavements: Factors effecting Design. Deflection studies in Flexible Pavements. Present Serviceability Index, Pavement Performance and methods- AASHTO and Asphalt Institute Method.

UNIT V

Design of Rigid Pavements: Factors effecting Design – Wheel load & its repetition, subgrade strength & proportion, strength of concrete- modulus of elasticity, Reinforcement in slab, Design of joints. Design of Dowel bars, Design of Tie bars. AASHTO methods of Rigid Pavement design.

Text Books:

1. Principles of Pavement Design, Yoder.J. &Witzorac Mathew, W. John Wiley & Sons Inc
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

3. AASHTO Pavement Design Guide (1993)

References:
1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
3. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC: 37 & 58 Codes for Flexible and Rigid Pavements Design.

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET24
Name of the Course	**REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM (Professional Elective – II)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Generalize the basic principles of Remote Sensing and GIS, including ground, air and satellite based sensor platforms (K2)
- Interpret the aerial photographs and satellite imageries (K2)
- Relate the process of data entry and preparation (K3)
- Examine the Spatial Data for a variety of applications (K3)
- Employ RS and GIS for diverse applications (K3)

SYLLABUS

UNIT I
Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems.
Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER,RISAT and CARTOSAT.

UNIT II
Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III
Geographic Information System: Introduction, key components, application areas of GIS, map projections.
Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT IV
Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

UNIT V
RS and GIS Applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.
Applications of Hydrology, Water Resources and Disaster Management: Food zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

Text Books:
1. "Remote sensing and GIS", Bhatta, B., Oxford University Press, 2008.
2. "Remote Sensing and Geographical Information Systems", Anji Reddy, M., B S Publications, 2008.
3. "Basics of Remote Sensing and GIS" Kumar. S., Laxmi Publications,

References:
1. "Fundamentals of Remote Sensing", George Joseph, Universities Press, 2013.
2. "Concepts and Techniques of Geographical Information System", Chor Pang Lo and Yeung, A.K.W., Prentice Hall, India, 2006.
3. "Remote Sensing and its Applications", Narayan L.R.A, Universities Press, 2012.
4. "Introduction to Geographic Information Systems", Kand Tsung Chang, McGraw Hill Higher Education, 2009.
5. "Basics of Remote sensing & GIS", Kumar, S., Laxmi Publications, New Delhi, 2005.
6. "Principals of Geographical Information Systems", Burrough, P.A and McDonnell, R.A. Oxford University Press, 1998.
7. "Remote Sensing", Schowenger, R. A., Elsevier publishers, 2006.
8. "Remote Sensing and Image Interpretation", Lillesand, T.M, Kiefer, R.W. and Chipman, J.W., Wiley India Pvt. Ltd., New Delhi, 2013.
9. "Fundamentals of Geographic Information Systems", Demers, M.N, Wiley India Pvt. Ltd, 2013

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CEL09
Name of the Course	**ENVIRONMENTAL ENGINEERING LAB**					
Branch	CIVIL ENGINEERING					

Course outcomes:

Upon successful completion of this course the student will be able to
- Illustrate the characteristics of water and waste water (K3)
- Predict the portability of water (K3)
- Examine the condition of water based on the tested parameters (K3)
- Determine the dissolved oxygen, BOD and COD of water (K4)

List of Experiments:
1. Sampling of water for testing (Demonstration)
2. Determination of alkalinity or acidity
3. Determination of chlorides in water and soil
4. Determination and estimation of total solids, organic and inorganic solids, settle able solids
5. Determination of Iron
6. Determination of pH and Electrical Conductivity of water and soil
7. Determination of Optimum coagulant dose
8. Determination of Chlorine demand
9. Determination and estimation of total hardness – calcium and magnesium
10. Determination of N, P, K values in solid waste
11. Physical parameters – Temperature, colour, odour, turbidity, taste.
12. Presumptive Coliform test
13. Determination of Dissolved Oxygen and BOD
14. Determination of COD

List of Equipments:
1. pH Meter
2. Turbidity Meter
3. Conductivity Meter
4. Hot Air Oven
5. Muffle Furnace
6. Dissolved Oxygen Meter
7. U-V Visible Spectrophotometer
8. COD Reflux Apparatus
9. Jar Test Apparatus
10. BOD Incubator
11. Autoclave
12. Hazens Apparatus
13. Imhoff Cone

References:
1. "Standard methods for analysis of water and waste water", APHA.
2. "Chemical analysis of water and soil", Murali Krishna, KVSG., Reem publications, New Delhi.

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CEL10
Name of the Course	CAD & GIS LAB					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Design 2D and 3D frames using STAAD PRO (K3)
- Design the retaining wall and simple towers using STAAD PRO (K3)
- Create thematic maps with relevant features (K5)
- Develop digital elevation models using GIS software (K3)

Note: Conduct any 10 experiments, 5 each from CADD software and GIS software.

COMPUTER AIDED DESIGN AND DRAWING SOFTWARE:
- STAAD PRO
- STRAAP
- STUDDS

List Of Experiments
- 2-D Frame Analysis and Design
- Steel Tabular Truss Analysis and Design
- 3-D Frame Analysis and Design
- Retaining Wall Analysis and Design
- Simple Tower Analysis and Design.
- Analysis of beam with different end conditions
- Analysis of multistoried building design
- Analysis of space stress
- Wind analysis of tall structure
- Analysis and design of elevated water tank

GEOGRAPHICAL INFORMATION SYSTEM SOFTWARE:
- Arc GIS 9.0
- ERDAS 8.7
- Mapinfo 6.5

List Of Experiments
- Georeferencing-toposheet
- Georeferencing-satellite image
- Creating a layer stack
- Extracting features-digitizing
- Map layout and analysis
- Raster supervised classification
- Raster unsupervised classification
- Raster Analysis- Urban Development
- Raster Analysis- Water bodies

- Creation of thematic maps.
- Estimation of features and interpretation
- Vector Analysis – Route Map
- Vector Analysis – village/ place/ point identification
- Creation of DEM (Digital Elevation Model)

References:
1. Computer aided design lab (Civil) Engineering by shesha Prakash and suresh S.
2. Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

Sem	VI Sem	L	T	P	C	COURSECODE
Regulation	V20	0	0	3	1.5	V20CEL11
Name of the Course	**ESTIMATION, CONTRACTS & CONSTRUCTION MANAGEMENT LAB**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Estimate the quantities of different items of construction work (K2)
- Analyze the cost of different items of construction work (K3)
- Compute the quantities for earth work of roads, canals (K3)
- Relate the specification of different works and make contract documents (K3)
- Employ different techniques in the process of construction planning and management (K3)

List of Work Practices

- Estimation of building using Individual Wall Method (two or more rooms)
- Estimation of building using Center Line Method (two or more rooms)
- Schedule of bar bending for beams and slab
- Earthwork estimation using different methods
  Mid-sectional area method,
  Mean sectional area method,
  Trapezoidal rule,
  Prismoidal rule
- Valuation of various items of work
- Preparation of Contract Document
- Project Network Techniques
  Bar Chart
  Programme Evaluation and Review Technique
  Critical Path Method
- Detailed study on Earth Work, Hoisting and Concreting Equipment's

References:

1. "Estimating and Costing" by B.N.Dutta, UBS publishers, 2000.
2. "Estimating and Costing" by G.S.Birdie.
3. "Method of Measurement of Building & Civil Engg Works – IS1200 (Parts I to XXV-1974) "Estimation, Costing and Specifications" by M.Chakraborthi, Laxmi Publications.

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20CEMC01
Name of the Course	**INTELLECTUAL PROPERTY RIGHTS & PATENTS**					
Branch	**CIVIL ENGINEERING**					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Describe the need of Intellectual Property Rights (K2)
- Generalize different issues regarding Copy Rights (K2)
- Employ the procedure for Patent registration and granting (K3)
- Discuss the importance of Trademark and its related issues (K2)
- Recognize the significance of Trade Secrets in Industry (K2)
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SYLLABUS

UNIT I
Introduction to Intellectual Property Rights (IPR): Introduction to IPR, Evolutionary Past, Concept of IPR – Purpose of IPR, Types of IPR, WIPO -TRIPS, Nature of IPR, Patents, Trademarks, Copyrights, Neighboring Rights, Agencies responsible for IPR - Infringement, Use and Misuse of Intellectual Property Rights.

UNIT II
Copyrights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Copyright Ownership – Transfer and Duration – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Semiconductor Chip Protection Act.

UNIT III
Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Registration and Granting of Patent -Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing – Software Protection and Computer related Innovations.

UNIT IV
Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – – Trade Mark Registration – Trade Mark Maintenance – Transfer of rights – Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V
Trade Secrets: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of

Unfair Competition – Trade Secret Litigation – Applying State Law, Cyber Law and Cyber Crime

Text Books:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.

2. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi

3. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.

References:

1. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.

2. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.

3. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).

4. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.

5. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

VII SEMESTER – SYLLABUS

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET25
Name of the Course	**PRESTRESSED CONCRETE (Professional Elective – III)**					
Branch	CIVIL ENGINEERING					

COURSE OUTCOMES:
Upon the successful completion of course students will be able to
- Discuss the basic concepts of prestressing system (K2)
- Analyze the effective prestress and bending stresses (K4)
- Analyze the deflections and flexural strength of prestressed concrete beams (K4)
- Analyze the prestressed concrete beams under Shear and torsion (K4)
- Design the end zone of prestressed concrete members (K5)

UNIT I
Introduction: Basic concepts of prestressing; Need for High strength steel and High strength concrete. Terminology; Advantages and Applications of Prestressed Concretes, Materials for prestressed Concrete: High strength concrete; High tensile steel.
Prestressing Systems: Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems

UNIT II
Analysis of Prestress and Bending Stresses: Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing.
Losses of Prestress: Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

UNIT III
Deflections of Prestressed Concrete Members: Importance of control of deflections; Factors influencing deflections; Short term deflections of un-cracked members; Effect of tendon profile on deflections.
Limit State of Collapse: Flexural Strength of Prestressed Concrete Sections: Ultimate flexural strength of rectangular sections and T-sections using simplified IS code recommendations.

UNIT IV
Limit State of Collapse: Shear Resistance of Prestressed Concrete Members: Shear and principal stresses; Shear- IS Code recommendations: Ultimate shear resistance of prestressed concrete members; Design of shear reinforcement.
Torsional Resistance of Prestressed Concrete Members: Design of reinforcements for torsion, shear and bending.

UNIT V
Design of End Blocks: Transmission of prestress in pretensioned members;
 Transmission length; Anchorage stress in post tensioned members; Bearing stress and bursting tensile force stresses in end blocks-Methods. IS Code provision for the design of end block reinforcement.

Text Books: (supplemented with IS: 1343)
  1. Prestressed Concrete by N. Krishna Raju; Tata Mc.Graw - Hill Publishing Company Limited, New Delhi.
  2. Pre-stressed Concrete- P. Dayarathnam: Oxford and IBH Publishing Co.
  3. Prestressed Concrete, S. Ramamrutham

References:
  1. Prestressed concrete by N. Rajagopalan; Narosa Publishing House.
  2. Design of pre-stressed concrete structures- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
  3. Fundamental of pre-stressed concrete- N.C. Sinha & S.K. Roy
  4. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET26
Name of the Course	ADVANCED FOUNDATION ENGINEERING (Professional Elective – III)					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course, the student will be able to

- Illustrate the safe bearing capacity and settlement of footings subjected to different types of loading (K3)
- Employ suitable techniques for proportioning the foundations laid on different soils strata (K3)
- Assess the forces acting on Earth Retaining Structures using different earth pressure theories (K3)
- Predict the load carrying capacity, pull-out capacity, negative skin friction of piles and their settlements (K3)
- Interpret different foundation practices in expansive soils (K3)

SYLLABUS

UNIT I

Bearing capacity of Foundation: using general bearing capacity equation–Meyerhof's, Brinch Hansen's and Vesic's methods-Bearing capacity of Layered Soils: Strong layer over weak layer, Weak layer on strong layer.

Settlement analysis: Immediate settlement, consolidate settlement, corrections, settlement of footings resting on granular soils and clay soils – Schmertmann & Hartman method – Janbu's method.

UNIT II

Mat foundations: Purpose and types of isolated and combined footings – Mats/Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils– compensated rafts.

UNIT III

Earth-retaining structures: cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components– forces in ties – stability against bottom heave.

UNIT IV

Pile foundations: single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils– Davisson and Gill method – Broms'analysis.

UNIT V
Foundations in expansive soils: definitions of swell potential and swelling pressure – determination of free swell index – factors affecting swell potential and swelling pressure – foundation practices – sand cushion method – CNS layer - drilled piers and belled piers– under-reamed piles – moisture control methods.

Text Books:
1. Principles of Foundation Engineering, B M Das, CENTAG Learning
2. Soil Mechanics and Foundation Engineering, V N S Murthy, CBS Publishers
3. Basic and applied soil mechanics by Gopal Ranjan and ASR Rao, New Age Publishers

References:
1. Foundation Analysis and Design, J.E.Bowles, JohnWiley
2. Foundation Design, W.C.Teng, Prentice Hall Publishers
3. Analysis and Design of Foundations and Retaining Structures by Prakash S edited by Saritha Prakashan

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET27
Name of the Course	**GROUND WATER DEVELOPMENT (Professional Elective – III)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Estimate aquifer parameters and its yield (K2)
- Design the wells and its associated components (K5)
- Generalize the well construction, development and its maintenance (K3)
- Organize the process of artificial recharge for increasing ground water potential (K3)
- Interpret geophysical exploration data for aquifers and their sources (K3)

SYLLABUS

UNIT I
Ground water and Well Hydraulics: Hydrologic Cycle -Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation - Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

UNIT II
Well Design: Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

UNIT III
Well Construction and Development: Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and backwashing, well completion, well disinfection, well maintenance.

UNIT IV
Artificial Recharge: Concept of artificial recharge of groundwater, recharge methods-basin, Stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge.
Saline Water Intrusion: Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.
UNIT V
Geophysics: Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging, Aerial Photogrammetry applications.

Text Books:
1. 'Ground water' by Raghunath H M, New Age International Publishers, 2005.
2. 'Ground water Hydrology' by Todd D.K., Wiley India Pvt Ltd., 2014.
3. 'Ground water Hydrology' by Todd D K and L W Mays, CBSPublications, 2005.

References:
1. 'Groundwater Assessment and Management' by Karanth K R, Tata Mc Graw Hill Publishing Co., 1987.
2. 'Groundwater Hydrology' by Bouwer H, McGraw Hill Book Company, 1978.
3. 'Groundwater Systems Planning and Management' by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. 'Groundwater Resources Evaluation' by Walton W C, McGraw Hill Book Company, 1978.

Sem	VII Sem	L	T	P	C	**COURSE CODE**
Regulation	V20	3	0	0	3	V20CET28
Name of the Course	**HIGHWAY CONSTRUCTION AND MANAGEMENT (Professional Elective – III)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon the successful completion of course students will be able to
- Employ techniques in the planning of Base, Subbase and Shoulders of pavement (K2)
- Prepare a methodology in the laying of bituminous pavements (K3)
- Relate different concepts in the construction of Cement Concrete Pavements (K3)
- Prepare a procedure for the maintenance of Cement Concrete Pavements(K3)
- Develop proper Pavement Management Systems (K3)

SYLLABUS

UNIT I
Construction of Base, Subbase and Shoulders: Roadway and Drain Excavation, Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilized Sub- Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction.

UNIT II
Bituminous Construction: Preparation and Laying of Tack Coat; Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC Specifications.

UNIT III
Cement Concrete pavement Construction: Cement Concrete Pavement Analysis - Construction of Cement Roads, Manual, and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.

UNIT IV
Bituminous and Cement Concrete pavement Maintenance: Repair of surface layer, Base layer, sub base layer, Sub grade, Maintenance of Concrete slab, Dry Lean concrete sub base layer and Subgrade in concrete pavement.

UNIT V
Pavement Management Systems: Pavement Management Systems- Components, structure, data requirements, Project level and Network level needs, Pavement performance prediction – concepts, modelling techniques, Budget forecasting for maintenance and rehabilitation.

Text Books :
1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.

2. Ralph C.G. Haas, W. Ronald Hudson and Zanieswki "Modern Pavement Management", Mc Graw Hill and Co,1994
3. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi.
4. MORTH - Specifications.

References:
1. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi.
2. Transportation Engineering - An Introduction, Jotin Khisty C, Prentice Hall, Englewood Cliffs, New Jersey.
3. Transportation Engineering and Planning, Papacostas C.S. and P.D. Prevedouros, Prentice Hall of India Pvt.Ltd; New Delhi.

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET29
Name of the Course	ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT (Professional Elective – III)					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of the course, the student will be able to

- Prepare different reports related to EMP, EIS, and EIA (K3)
- Select an appropriate EIA methodology (K2)
- Assess the Impact of development activities and land use (K3)
- Employ in procuring the natural resources and assessment of Eco system (K3)
- Develop the EIA notifications and reports (K3)

SYLLABUS

UNIT I

Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map- Classification of environmental parameters role of stakeholders in the EIA preparation stages in EIA

UNIT II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis – EIS and EMP

UNIT III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT IV

Procurement of natural resources and assessment of eco system: Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment – wild life - deforestration

Environmental Risk Assessment and management: Risk assessment and treatment of uncertainty-key stages

UNIT V

EIA notification: EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, procedure for environmental clearance, and procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000, Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y.Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.
3. Environmental Impact Assessment and Management, B B Hosetti, A.Kumar, Daya Publishing House (2014)

References:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke PrenticeHall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. ,Katania& Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

Sem	VII Sem	L	T	P	C	**COURSE CODE**
Regulation	V20	3	0	0	3	V20CET30
Name of the Course	**FINITE ELEMENT METHOD (Professional Elective – IV)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of the course, the student will be able to

- Generalize the concept of Finite Element Method (K2)
- Employ different formulation techniques of FEM to the engineering problems (K3)
- Assess one dimensional solid elements of various practical problems (K3)
- Analyze different components of framed structure (K4)
- Analyze the two and three dimensional solids using FEM (K4)

SYLLABUS

UNIT I
Introduction to Finite Element Analysis: Basic Concepts of Finite Element Analysis - Introduction to Elasticity -Steps in Finite Element Analysis

UNIT II
Finite Element Formulation Techniques: Virtual Work and Variational Principle - Galerkin Method- Finite Element Method: Displacement Approach -Stiffness Matrix and Boundary Conditions

UNIT III
Element Properties: Natural Coordinates -Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements -Solid Elements - Isoparametric Formulation -Stiffness Matrix of Isoparametric Elements - Numerical Integration: One Dimensional - Numerical Integration: Two and Three Dimensional- Worked out Examples

UNIT IV
Analysis of Frame Structures: Stiffness of Truss Members -Analysis of Truss - Stiffness of Beam Members - Finite Element Analysis of Continuous Beam -Plane Frame Analysis - Analysis of Grid and Space Frame

UNIT V
FEM for Two and Three Dimensional Solids: Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements - Numerical Evaluation of Element Stiffness - Computation of Stresses, Geometric Nonlinearity and Static Condensation - Axisymmetric Element - Finite Element Formulation of Axisymmetric Element - Finite Element Formulation for 3 Dimensional- Elements Worked out Examples

Text Books:

1. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.
2. A first course in the Finite Element Method, Dary L. Logan, Thomson Publications.
3. The Finite Element Method- Zinkiewicz, O.C. and Taylor, R.L , Oxford .
4. Finite Element Analysis Theory and Programming- Krishnamoorthy, C.S, Tata McGraw-Hill Education.

References:

1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sons Publication .
2. Introduction to Finite Element Method, Desai & Abel CBS Publication.
3. Introduction to Finite Element Method- P.N. Godbole, I K International Publishing House Pvt. Ltd.
4. The Finite Element Method in Engineering- S.S. Rao, Butterworth-Heinemann;
5. An Introduction to Finite Element Method- Reddy, J. N., McGraw-Hill Education

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET31
Name of the Course	**ENGINEERING WITH GEO-SYNTHETICS (Professional Elective – IV)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to

- Relate the need and demand of geo-synthetic materials in the field of geotechnical related works (K3)
- Apply the geotextiles and geogrids to practical problems (K3)
- Interpret the functions and applications of Geomembranes and Geocomposites (K3)
- Assess the internal and external stability of Reinforced Earth Retaining Wall (K3)
- Examine the applications of geo-synthetics in road construction (K3)

SYLLABUS

UNIT I
Geosynthetics: Introduction to Geosynthetics – Basic description – Polymeric materials– Uses and Applications, Properties of Geotextiles – Geogrids – Geomembranes – Geocomposites.

UNIT-II
Geotextiles: Design criteria for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers.
Natural Geotextiles: Natural fibres as geotextiles- factors governing the use jute fibres-coir geotextiles-bamboo/timber-combination of geotextiles.
Geogrids: Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods.

UNIT-III
Geomembranes: Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners– Caps and closures, moisture barriers.
Geocomposites: An added advantage – Geocomposites in Separation – Reinforcement – Filtration – Geocomposites as Geowebs and Geocells.

UNIT-IV
Reinforced Earth Retaining Walls: Components - External stability – Internal stability - Design of reinforced earth walls with strip, sheet and grid reinforcement.

UNIT-V
Use of Geosynthetics in Roads: Geosynthetics in road ways- applications role of subgrade conditions-design criteria-survivability-application in paved roads.

Text Books:
1. Designing with Geosynthetics by Robert M. Koerner, Prantice Hall, Eaglewood Cliffs, NJ.
2. An Introduction to Soil Reinforcement and Geosynthetics' by G.L.Sivakumar Babu (2009), Universities Press (India) Pvt. Ltd.
3. Engineering with Geosynthetics', by G. Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.

References:
1. 'Construction and Geotechnical Engineering using Synthetic Fabries' by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
2. 'Foundation Analysis and Design' by J.E. Bowles McGraw Hill Publications.

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET32
Name of the Course	URBAN TRANSPORTATION PLANNING (Professional Elective – IV)					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to
- Employ the Urban Transportation Problems & Travel Demand (K3)
- Relate the techniques in the data collection for planning the network (K3)
- Develop various models for trip generation, trip distribution and traffic assignment (K3)
- Prepare various alternative transportation proposals (K3)
- Solve the traffic assignment for transport network (K5)

SYLLABUS

UNIT I
Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT II
Data Collection and Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT III
Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT IV
Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

UNIT V
Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies

Text Books:
1. Introduction to Urban System Planning, Hutchinson, B.G., McGraw Hill.
2. Transportation Engineering - An Introduction, Khisty C.J., Prentice Hall

References:
1. Introduction to Transportation Planning, Bruton M.J., Hutchinson of London.
2. Fundamentals of Transportation Planning, Papacostas, Tata McGraw Hill
3. Urban Transportation Planning: A decision oriented Approach, Mayer M and Miller E, McGraw Hill
4. Traffic Engineering and Transportation Planning, Kadiyali.L.R., Khanna Publishers, New Delhi.
5. Metropolitan Transportation Planning, Dicky, J.W., Tata McGraw Hill

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET33
Name of the Course	**SOLID WASTE MANAGEMENT (Professional Elective – IV)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course, the students will be able to
• Relate the factors influencing generation of solid waste and its management (K3)
• Assess the basic elements for managing the Solid Waste (K3)
• Develop different methods for transportation and transformation of solid waste (K3)
• Prepare different methods for processing and treatment of municipal solid waste (K3)
• Find suitable disposal methods with respect to solid waste (K3)

SYLLABUS

UNIT I
Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste – sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT II
Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Types and methods of waste collection systems, analysis of collection system – optimization of collection routes.

UNIT III
Transportation and Transformation of Solid Waste: Need for transfer operation, compaction of solid waste – transport means and methods, transfer station types and design requirements.
Unit operations used for separation and transformation: shredding – materials separation and recovery, source reduction and waste minimization.

UNIT IV
Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT V
Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:
1. "Integrated Solid Waste Management", George Techobanoglous, McGraw Hill Publication, 1993
2. "Environmental Engineering", Gerard Kiely, McGraw Hill Publication, 2007
3. "Environmental Science and Engineering", J Glynn Henry,. Gary W.Heinke, Prentice-Hall of India Pvt Ltd, 1996

References:
1. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
2. "Hazardous Waste Management", Charles A. Wentz., McGraw Hill Publication, 1995.
3. "Introduction to Environmental Engineering" Mackenzie L Davis, David A.Cornwell, McGraw Hill Publication, 2017

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET34
Name of the Course	**PREFABIRCATED STURCTURES (Professional Elective – IV)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Relate the principles of prefabrication, production and erection processes (K3)
- Practice different ways to utilize prefabricated components (K3)
- Design the prefabricated components to mount on the precast concrete system (K5)
- Prepare types of joints and connections to accommodate in precast system (K3)
- Use codal provisions to avoid progressive collapse to abnormal loads (K3)

SYLLABUS

UNIT I

Introduction: Need for prefabrication – Principles of prefabrication – Modular coordination – Standardization – Materials – Systems – Production – Transportation – Erection.

UNIT II

Prefabricated Components: Behavior and types of structural components – Large panel systems – roof and floor slabs – Walls panels - Beams - Columns - Shear walls

UNIT III

Design Principles: Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.

UNIT IV

Joints and Connections in Structural Members: Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion, Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.

UNIT V

Design for Abnormal Loads: Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Text Books:
1. "Prefabrication with Concrete", Bruggeling A.S. G and Huyghe G.F., A.A. Balkema Publishers, USA,1991.
2. "Precast Concrete- Materials, Manufacture, Properties And Usage", Lewitt,M., Applied Science Publishers, London and New Jersey, 1982.
3. "Precast Concrete Structures", Bachmann, H. and Steinle, A., Ernst &Sohn, Berlin, 2011.

References:
1. "Manual of precast concrete construction", Koncz T., Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 2009

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET35
Name of the Course	**EARTHQUAKE ENGINEERING (Professional Elective – V)**					
Branch	CIVIL ENGINEERING					

Course Outcomes

At the end of the course the student will be able to

- Discuss the basic concept and characteristics of earth quakes (K2)
- Examine the ground motion and seismic hazard (K3)
- Assess the frequency of wave propagation in different mediums (K3)
- Illustrate the behavior and resistive forces generated in the structure during earthquake (K3)
- Relate the possibility of liquefaction and ground improvement for remediation of seismic hazards (K3)

SYLLABUS

UNIT I

Introduction to Dynamic Loads: Static Load v/s Dynamic Load, Types of Dynamic forces, Force Control and Displacement Control.

Seismology and Earthquakes: Introduction, Seismic Hazards, seismic waves, internal structure of earth, Continental drift and plate tectonics, faults, elastics rebound theory, geometric notations, location of earthquakes, size of earthquakes.

UNIT II

Strong Ground Motion: Strong ground motion measurement, ground motion parameters, estimation of ground motion parameters.

Seismic Hazard Analysis: Identification and Evaluation of Earthquake Sources, deterministic seismic hazard analysis, probabilistic seismic hazard analysis.

UNIT III

Wave Propagation: Waves in unbounded media, waves in a semi – infinite body, waves in a layered media, attenuation of stress waves.

Artificial Ground Motion Generation: Modification of actual ground motion records, time –domain generation, frequency domain generation.

UNIT IV

Behavior of Structures: During Earthquake and Earthquake Resistant Features of Structure Inertia forces in structures, Behavior of Masonry Structures, Behavior of RC Structures

UNIT V
Liquefaction: Flow liquefaction, cyclic mobility, evaluation of liquefaction hazards, liquefaction susceptibility, initiation of liquefaction, effects of liquefaction.
Soil Improvement for Remediation of Seismic Hazards: Densification techniques, Reinforcement Techniques, Grouting and Mixing techniques, Drainage techniques.

Text Books:
1. Earthquake Resistant Design of Structures By Pankaj Agarwal & Manish Shrikhande, PHI Publications
2. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi.
3. K. Chopra; Dynamics of Structures, Pearson, New Delhi
4. Park & Pauly; Behavior of R.C Structures
5. Geotechnical Earthquake Engineering by Steven L. Kramer, prentice Hall

Reference Books:
1. IS: 1893 (Part-I) 2002, Criteria for Earthquake Resistant Design General Provision to Building.
2. S: 13920 (1993), Code of Practice for Ductile Detailing of RC Structures
3. IS: 4326 (1993), Code of Practice for Earthquake Resistant Design and Construction of Buildings
4. IS: 13827 (1993), Improving Earthquake Resistance of Earthen Buildings
5. IS: 13828 (1993), Guide lines for Improving Earthquake Resistance of low Strength Masonry Buildings.
6. S S Rao; Mechanical Vibration; Pearson, New Delhi.

Sem	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET36
Name of the Course	**GROUND IMPROVEMENT TECHNIQUES** (Professional Elective – V)					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to

- Employ the in-situ densification methods at ground surface and at depth (K3)
- Relate the importance of dewatering and different methods of stabilization (K3)
- Illustrate the reinforced earth technology and soil nailing to obviate the problems posed by conventional retaining walls (K3)
- Use the geosynthetics to improve the engineering performance of soils (K3)
- Select different techniques of grouting to solve the ground problems (K3)

SYLLABUS

UNIT I
In situ densification methods: In situ densification of granular soils-vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT II
Dewatering: Sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells– electro osmosis
Stabilization of soils: Methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT III
Reinforced earth: Principles – components of reinforced earth –stability checks – soil nailing

UNIT IV
Geosynthetics: Geotextiles – types – functions, properties and applications – geogrids, geomembranes and gabions – properties and applications.

UNIT V
Grouting: Objectives of grouting – grouts and their applications – methods of grouting – stage of grouting.

Text Books:
1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

References:
1. Ground Improvement, M.P.Moseley, Blackie Academic and Professional, USA
2. Designing with Geosynethetics, R. M Koerner, Prentice Hall
3. Engineering Principles of Ground Modification by Manfred R. Hausmann,McGraw-Hill Inc.,

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET37
Name of the Course	**RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEMS (Professional Elective – V)**					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon the successful completion of course students will be able to

- Generalize the concept and scope of sanitation in rural areas (K2)
- Apply suitable methods of water treatment for rural areas (K3)
- Develop the water distribution system in rural areas (K3)
- Relate the different public sanitation methods in rural areas and industrial zones (K3)
- Relate different methods of solid waste management in rural areas (K3)

SYLLABUS

UNIT I
Concept of environmental and scope of sanitation in rural areas: Magnitude of problem of water supply and sanitation – population to be covered and difficulties National policy, Various approaches for planning of water supply systems in rural areas, Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source.

UNIT II
Specific problems: Specific problems in rural water supply and treatment e.g. iron, manganese, fluorides etc., Low cost treatment, appropriate technology for water supply and sanitation, Improvised method and compact system of treatment of surface and ground waters such as MB settlers, slow and sand filter, chlorine diffusion cartridge etc., Water supply through spot sources, hand pumps, open dug –well.

UNIT III
Planning of distribution system in rural areas: Water supply during fairs, festivals and emergencies, Treatment and disposal of wastewater/sewage, various method of collection and disposal of night soil

UNIT IV
Rural sanitation and industrial hygiene: Simple wastewater treatment system for rural areas and small communities such as stabilization ponds, septic tanks, soakage pits etc., Occupational Hazards- Schools- Public Buildings- Hospitals- Eating establishments- Swimming pools – cleanliness and maintenance and comfort- Industrial plant sanitation

UNIT V
Solids Waste: Collection, Transfer, Transport and deposit of solid waste management, composting, land filling.

Text Books:
1. "Water Supply and Sanitary Engineering" by Rangwala, Charotar Publishing House Pvt Ltd.,
2. "Water Supply and Sanitary Engineering" by G.S.Birdie and J.S.Birdie, Dhanpat Rai Publishing Company

References:
1. "Manual of water supply and treatment", 3rd edition, CPHEEO, GOI, New Delhi.
2. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004

Sem	VIISem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET38
Name of the Course	METRO SYSTEMS AND ENGINEERING (Professional Elective – V)					
Branch	CIVIL ENGINEERING					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Generalize different Metro Systems and their planning (K2)
- Relate construction methods of elevated and under ground stations (K3)
- Employ the construction quality and safety systems (K3)
- Illustrate the methods to utilize electronic signaling systems and automatic fare collection systems (K3)
- Organize the mechanical and electrical work of different systems (K3)

SYLLABUS

UNIT I
General: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and
Financials

UNIT II
Construction Methods: Civil Engineering- Overview and construction methods for elevated and underground stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings, Initial Surveys & Investigations;

UNIT III
Quality & Safety Systems: Basics of Construction Planning & Management, Construction Quality & Safety Systems, Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safe guards; Track systems-permanent way. Facilities Management

UNIT IV
Operation Control Center: Electronics and Communication Engineering-Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

UNIT V
Mechanical & Rolling Stock: Mechanical & TVS, AC: Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators.
Electrical: OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back - up systems; Green buildings, Carbon credits and clear air mechanics.

Text Books:
1. "Metro Rail in India for Urban Mobility", by MM Agarwal, Sudhir Chandra and KK Miglani – Prabha& Co, 2021
2. "World Metro Systems", Paul Garbutt, Capital Transport Pub; 2nd Edition, 1997.

References:
1. General & Technical information of Hyderabad Metro
2. General & Technical information of Delhi Metro

Sem	VII Sem	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CET39
Name of the Course	**ARCHITECTURE AND TOWN PLANNING** (Professional Elective – V)					
Branch	CIVIL ENGINEERING					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Distinguish architectural styles of eastern and western world (K2)
- Understand the importance of Orders of architecture (K2)
- Develop spaces of buildings using design concepts, planning principles (K3)
- Relate the present town planning from ancient times to modern times.
- Interpret the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities (K3)

SYLLABUS:

UNIT I
History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT II
Architectural Design: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT III
Principles of Planning: Principles of planning a residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors. Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

UNIT IV
Historical Back Ground of Town Planning: Town planning in India – Town plans of mythological Manasa - Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT V
Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning Neighborhood Planning. Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation planning regulations and limitations.
Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns floating towns- sky scrapers-pyramidal cities.

Text Books:

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S. Sane., Civil Engineering 142
3. 'Professional Practice' by G.K. Krishnamurthy, S.V. Ravindra, PHI Learning, New Delhi.
4. 'Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning' by G.K. Haraskar.

References:

1. 'Drafting and Design for Architecture' by Hepler, Cengage Learning
2. 'Architect's Portable Handbook' by John Patten Guthrie – Mc Graw Hill International Publications.
3. 'Modern Ideal Homes for India' by R. S. Deshpande.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.
5. 'Town Design' by Federik Glbbard, Architectural press, London.

ANNEXURE - III
COURSES OFFERED UNDER OPEN ELECTIVE IN V, VI & VII SEMESTER TO OTHER BRANCHES

Name of the Course	Course code
1. Repair and Rehabilitation of Structures	V20CEOE01
2. Ground Improvement Techniques	V20CEOE02
3. Environmental Pollution and Control	V20CEOE03
4. Building Materials and Construction	V20CEOE04
5. Remote Sensing and GIS	V20CEOE05
6. Solid Waste Management	V20CEOE06
7. Disaster Management	V20CEOE07
8. Water Quality and Conservation Systems	V20CEOE08

COURSES OFFERED UNDER MANDATORY COURSES IN V, VI & VII SEMESTER TO OTHER BRANCHES

Name of the Course	Course code
1. Intellectual Property Rights & Patents	V20CEMC01
2. Professional Ethics & Human Values	V20CEMC02

Open Elective -I

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE01
Name of the Course	**REPAIR AND REHABILITATION OF STRUCTURES**					
Branch	EXCEPT CE					

Course Outcomes:
Upon the successful completion of course students will be able to
- Develop various maintenance and repair strategies (K2)
- Evaluate the existing buildings through field investigations (K2)
- Understand and use the different techniques for structural rehabilitation and various techniques of repair (K2)
- Understand the importance of advanced concretes mixes(K2)
- Understand the importance of high performance concretes(K2)

SYLLABUS

UNIT I
Deterioration of Structures and diagnosis: Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage, Non Destructive Testing, Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment –

UNIT II
Materials for repair and rehabilitation: Admixtures- types of admixtures - purposes of using admixtures- chemical composition- Natural admixtures - Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates

UNIT III
Strengthening and stabilization: Techniques- design considerations-Beam shear capacity strengthening - Shear Transfer strengthening-stress reduction techniques- Column strengthening-flexural strengthening - Connection stabilization and strengthening, Crack stabilization

UNIT IV
Special Concretes: Fibre reinforced concrete: Properties of constituent materials- Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes-Light weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete- Flyash concrete - classification of flyash- Properties of flyash concrete

UNIT V
High performance concretes: Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes- Self Consolidating concrete-properties- qualifications.

Text Books:
1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa Kumar, Oxford University press
3. Concrete technology by Neville and J J Brooks, Pearson publications, 2nd edition

References:
1. Concrete technology by M S Shetty, S. Chand publications (2006).
2. Defects and Deterioration in Buildings, EF & N Spon, London
3. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
4. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
5. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A. Richardson, (1991)

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE02
Name of the Course	**GROUND IMPROVEMENT TECHNIQUES**					
Branch	EXCEPT CE					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Employ the in-situ densification methods at ground surface and at depth (K3)
- Relate the importance of dewatering and different methods of stabilization (K3)
- Illustrate the reinforced earth technology and soil nailing to obviate the problems posed by conventional retaining walls (K3)
- Use the geosynthetics to improve the engineering performance of soils (K3)
- Select different techniques of grouting to solve the ground problems (K3)

SYLLABUS

UNIT I
In situ densification methods: In situ densification of granular soils-vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT II
Dewatering: Sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells– electro osmosis
Stabilization of soils: Methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT III
Reinforced earth: Principles – components of reinforced earth –stability checks – soil nailing

UNIT IV
Geosynthetics: Geotextiles – types – functions, properties and applications – geogrids , geomembranes and gabions – properties and applications.

UNIT V
Grouting: Objectives of grouting – grouts and their applications – methods of grouting – stage of grouting.

Text Books:
1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

References:
1. Ground Improvement, M.P.Moseley, Blackie Academic and Professional, USA
2. Designing with Geosynethetics, R. M Koerner, Prentice Hall
3. Engineering Principles of Ground Modification by Manfred R. Hausmann,McGraw-Hill Inc.,

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE03
Name of the Course	ENVIRONMENTAL POLLUTION AND CONTROL					
Branch	EXCEPT CE NG					

Course Outcomes:
Upon successful completion of this course the student will be able to

- Describe the air pollution and its control methods (K2)
- Explain industrial waste water and ways to control it (K3)
- Generalize the solid, hazardous waste and control methods (K2)
- Illustrate the importance of Environmental sanitation methods (K2)
- Illustrate the importance of Sustainable development (K3)

SYLLABUS

UNIT I
Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.Noise Pollution: Noise standards, Measurement and control methods

UNIT II
Industrial wastewater Management: Strategies for pollution control – Volume and Strength reduction-Recirculation of industrial waste water – Effluent standards.

UNIT III
Solid Waste Management: Solid waste characteristics –on-site handling and collection – separation and processing -Solid waste disposal method
Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal methods.

UNIT IV
Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT V
Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- sustainable development.

Text Books:
1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.
2. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

References:
1. Solid Waste Engineering, Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE04
Name of the Course	**BUILDING MATERIALS AND CONSTRUCTION**					
Branch	EXCEPT CE					

Course Outcomes:
After successful completion of the course, the student will be able to:
- Describe different building materials and their importance in building construction (K2)
- Relate various components of cement and lime (K3)
- Generalize the brick and stone masonry in construction (K2)
- Interpret different aggregates and their specifications (K2)
- Describe the importance of different building components (K2)

SYLLABUS

UNIT I
Stones, Bricks and Tiles: Building stones – classifications and quarrying – properties –structural requirements and dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics, Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties– seasoning – defects; alternate materials for Timber–GI/ fibre – reinforced glass bricks, steel & aluminum, Plastics.

UNIT II
Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests, Admixtures – mineral & chemical admixtures – uses, Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime

UNIT III
Mortars: Lime and Cement Mortars.
Masonry: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick- stone composite; Concrete, Reinforced brick. Cavity and partition walls, Finishing's, Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.

UNIT IV
Aggregates: Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.
Miscellaneous materials: Bitumen and asphaltic materials, structural steel and other metals, geo textiles, carbon composites including properties and uses.

UNIT V
Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed. Foundations – types; Damp Proof Course; Joinery – doors – windows – materials – types.
Form work: Types: Requirements – Standards – Scaffolding.

Text Books:
1.   Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications. 2010,5th edition.
2.   Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi. 2014,5th edition,.
3.   Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi. 2016,11th edition.
4.   Building Materials, S. S. Bhavikatti, Vikas publications House private ltd. 2012, 1st edition.
5.   Building Construction, S. S. Bhavikatti, Vikas publications House private ltd. 2012, 1st edition.
6.   Building planning and drawing,Dr.N.Kumara swamy,A.kameswara Rao, 2012, 6th edition.

References:
1.   Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2017,1st edition.
2.   Building Materials by Duggal, New Age International. 2012 ,4th edition.
3.   Building Materials by P. C. Varghese, PHI. 2015, 2nd edition.
4.   Building Construction by PC Varghese PHI. 2007, 1st edition.
5.   Construction Technology – Vol – I & II by R. Chubby, Longman UK.1987, 2nd edition.
6.   Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.2017 ,2nd edition

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE05
Name of the Course	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM					
Branch	EXCEPT CE					

Course Outcomes:

Upon successful completion of this course the student will be able to
- Generalize the basic principles of Remote Sensing and GIS, including ground, air and satellite based sensor platforms (K2)
- Interpret the aerial photographs and satellite imageries (K2)
- Relate the process of data entry and preparation (K3)
- Examine the Spatial Data for a variety of applications (K3)
- Employ RS and GIS for diverse applications (K3)

SYLLABUS

UNIT I
Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems.
Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER,RISAT and CARTOSAT.

UNIT II
Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III
Geographic Information System: Introduction, key components, application areas of GIS, map projections.
Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT IV
Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

UNIT V
RS and GIS Applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.
Applications of Hydrology, Water Resources and Disaster Management: Food zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

Text Books:
1. "Remote sensing and GIS", Bhatta, B., Oxford University Press, 2008.
2. "Remote Sensing and Geographical Information Systems", Anji Reddy, M., B S Publications, 2008.
3. "Basics of Remote Sensing and GIS" Kumar. S., Laxmi Publications,

References:
1. "Fundamentals of Remote Sensing", George Joseph, Universities Press, 2013.
2. "Concepts and Techniques of Geographical Information System", Chor Pang Lo and Yeung, A.K.W., Prentice Hall, India, 2006.
3. "Remote Sensing and its Applications", Narayan L.R.A, Universities Press, 2012.
4. "Introduction to Geographic Information Systems", Kand Tsung Chang, McGraw Hill Higher Education, 2009.
5. "Basics of Remote sensing & GIS", Kumar, S., Laxmi Publications, New Delhi, 2005.
6. "Principals of Geographical Information Systems", Burrough, P.A and McDonnell, R.A. Oxford University Press, 1998.
7. "Remote Sensing", Schowenger, R. A., Elsevier publishers, 2006.

8. "Remote Sensing and Image Interpretation", Lillesand, T.M, Kiefer, R.W. and Chipman, J.W., Wiley India Pvt. Ltd., New Delhi, 2013.
9. "Fundamentals of Geographic Information Systems", Demers, M.N, Wiley India Pvt. Ltd, 2013

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE06
Name of the Course	**SOLID WASTE MANAGEMENT**					
Branch	EXCEPT CE					

Course Outcomes:

Upon successful completion of this course, the students will be able to
- Generalize Solid Waste and its management (K2)
- Assess different elements for managing Solid Waste (K3)
- Employ different methods for transportation and transformation of solid waste (K3)
- Organize different methods for processing and treatment of municipal solid waste (K3)
- Practice suitable disposal methods with respect to solid waste (K3)

SYLLABUS

UNIT I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste – sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT II

Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Types and methods of waste collection systems, analysis of collection system – optimization of collection routes.

UNIT III

Transportation and Transformation of Solid Waste: Need for transfer operation, compaction of solid waste – transport means and methods, transfer station types and design requirements.
Unit operations used for separation and transformation: shredding – materials separation and recovery, source reduction and waste minimization.

UNIT IV

Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT V
Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:
4. "Integrated Solid Waste Management", George Techobanoglous, McGraw Hill Publication, 1993
5. "Environmental Engineering", Gerard Kiely, McGraw Hill Publication, 2007
6. "Environmental Science and Engineering", J Glynn Henry,. Gary W.Heinke, Prentice-Hall of India Pvt Ltd, 1996

References:
3. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
4. "Hazardous Waste Management", Charles A. Wentz., McGraw Hill Publication, 1995.
4. "Introduction to Environmental Engineering" Mackenzie L Davis, David A.Cornwell, McGraw Hill Publication, 2017

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE07
Name of the Course	**DISASTER MANAGEMENT**					
Branch	EXCEPT CE					

Course Outcomes:
Upon successful completion of this course the student will be able to

- Describe different natural hazards and disaster management (K2)
- Generalize the risk and vulnerability of disaster (K2)
- Illustrate the role of technology in disaster management (K3)
- Relate the importance of education and community preparedness to disaster recovery (K3)
- Organize the multi-sectional issues created by disaster (K2)

UNIT I
Natural Hazards and Disaster Management: Introduction of DM Disaster Management cycle – Five priorities for action- Case study methods of the following: floods, droughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides. Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrotirism - rail and air craft's accidents-Management of these disasters

UNIT II
Risk and Vulnerability: – Building codes and land use planning – social vulnerability – environmental vulnerability -Financial management of disaster.

UNIT III
Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure - mitigation programme for earth quakes –geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training-transformable indigenous knowledge in disaster reduction.

UNIT IV
Education and Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building.

UNIT V

Multi-sectional Issues: Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction - The Red cross and red crescent movement.

Text Books:
1. Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy(2009),Universities press.
2. Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

Reference Books:
1. 'Disaster Management' edited by H K Gupta (2003), Universities press.
2. Natural Hazards and Disaster Management, Vulnerability and Mitigation by RB Singh
3. Disaster Management by Harish K.Gupta

Sem	V/VI/VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE08
Name of the Course	**WATER QUALITY AND CONSERVATION SYSTEMS**					
Branch	EXCEPT CE					

Course Outcomes:

Upon successful completion of the course, the student will be able to

- Describe different parameters of Engineering Hydrology (K2)
- Relate different sources of surface and ground water (K3)
- Assess the importance of water supply systems and quality of water in reference to IS and WHO standards (K3)
- Develop different systems of plumbing (K3)
- Employ different conservation techniques (K3)

SYLLABUS

UNIT I
Introduction to Hydrology: Engineering hydrology, applications, Hydrologic cycle, evaporation, evapotranspiration, precipitation, run off, infiltration, hydrological data-sources

UNIT II
Sources of Water: Surface water, Lakes, Rivers, Reservoirs, comparison of sources with reference to quality, quantity and other considerations.
Groundwater, types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

UNIT III
Importance of Protected Water: Supply systems, Flow chart of public water supply system, Water borne diseases, Estimation of water usages in different purpose.

Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics, Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water.

UNIT IV
Plumbing Systems: Systems of plumbing-types of pipes and sanitary fittings and other accessories–one pipe and two pipe systems – Design parameters and factors.

UNIT V
Water conservation: importance and necessity, objectives, systems-rainwater harvesting, recharge pits, watershed.

Text Books:
1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985
2. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie

References:
1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20CEMC01
Name of the Course	**INTELLECTUAL PROPERTY RIGHTS & PATENTS**					
Branch	**Common to All Branches**					

Course Outcomes:
Upon successful completion of this course the student will be able to
- Describe the need of Intellectual Property Rights (K2)
- Generalize different issues regarding Copy Rights (K2)
- Employ the procedure for Patent registration and granting (K3)
- Discuss the importance of Trademark and its related issues (K2)
- Recognize the significance of Trade Secrets in Industry (K2)

SYLLABUS

UNIT I
Introduction to Intellectual Property Rights (IPR): Introduction to IPR, Evolutionary Past, Concept of IPR – Purpose of IPR, Types of IPR, WIPO - TRIPS, Nature of IPR, Patents, Trademarks, Copyrights, Neighboring Rights, Agencies responsible for IPR - Infringement, Use and Misuse of Intellectual Property Rights.

UNIT II
Copyrights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Copyright Ownership – Transfer and Duration – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Semiconductor Chip Protection Act.

UNIT III
Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Registration and Granting of Patent -Exclusive Rights – Limitations - Ownership and Transfer – – Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing – Software Protection and Computer related Innovations.

UNIT IV
Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – – Trade Mark Registration – Trade Mark Maintenance – Transfer of rights – Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V

Trade Secrets: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law, Cyber Law and Cyber Crime

Text Books:
1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw – Hill, New Delhi
3. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.

References:
1. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
2. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
3. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
4. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
5. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

Sem	VI Sem	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20CEMC02
Name of the Course	**PROFESSIONAL ETHICS AND HUMAN VALUES**					
Branch	**Common to All Branches**					

Course Outcomes:

Upon successful completion of this course the student will be able to

- Discuss the importance of human values and their context (K2)
- Generalize the professional ethics and norms of engineering practice (K2)
- Review the contextual knowledge of engineering as social experimentation (K2)
- Identify the engineer's responsibility for Safety & Risks (K2)
- Clarify the professional rights & responsibilities at global level (K2)
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UNIT I

Human Values: Morals, Values and Ethics – Integrity – Work Ethics – Service Learning –Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing –Honesty –Courage – Value time – Co-operation – Commitment – Empathy –Self-confidence–Spirituality-Character.

UNIT II

Engineering Ethics: The History of Ethics, Purposes for Engineering Ethics, Consensus and Controversy, Professional and Professionalism, Professional Roles to be played by an Engineer –Self Interest, Customs and Religion, Uses of Ethical Theories, Professional Ethics, Types of Inquiry in Engineering Ethics.

UNIT III

Engineering as Social Experimentation: Comparison with Standard Experiments –now ledge gained–Conscientiousness–Relevant Information–Learning from the Past–Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes–odes and Experimental Nature of Engineering.

UNIT IV

Engineers' Responsibility for Safety and Risk: Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s long term Consequences, Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V

Engineers' Responsibilities, Rights & Global Issues: Collegiality, Senses of Loyalty, professionalism and Loyalty, Professional Rights & Responsibilities–confidential and proprietary information, Bribes/Gifts, Whistle Blowing. Globalization- Cross-culture Issues, Environmental Ethics, Computer Ethics, Weapons Development Ethics and Research Ethics, Intellectual Property Rights.

Text Books:

1. "Engineering Ethics and Human Values" by M. Govindarajan, S.Natarajan and V.S.Senthil Kumar-PHILearningPvt.Ltd-2009.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications.

References:
1. "Professional Ethics and Human Values"by Prof.D.R.Kiran.
2. "Indian Culture,Values and Professional Ethics"by PSRMurthy-BS Publication.
3. "Ethics in Engineering" by Mike W.Martin and Roland Schinzinger–TMH.